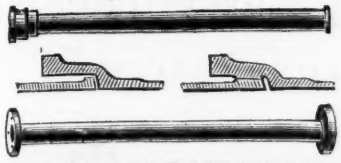
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LX. No. 1528.] LONDON, AUGUST 23, 1892. [44TH YEAR. PRICE 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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— ESTABLISHED 1830. —

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THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

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LONDON.

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LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

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GASHOLDERS

C. & W. WALKER

Are now erecting a four-lift Holder of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

PURIFIERS;

PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

PATENT SELF-SEALING RETORT MOUTHPIECES;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SOLE MANUFACTURERS OF WECK'S PATENT CENTRE-VALVE;

PATENT TAR PLANT; CONDENSERS;

SLIDE VALVES; TAR BURNERS; &C., &C.

WOOD SIEVES.

ADDRESSES:

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

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Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS.

SPECIALITY: PATENT CASH PREPAYMENT METERS.

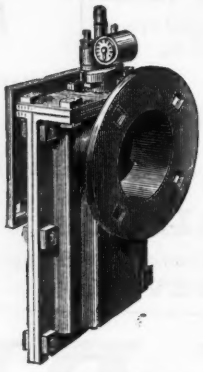
S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

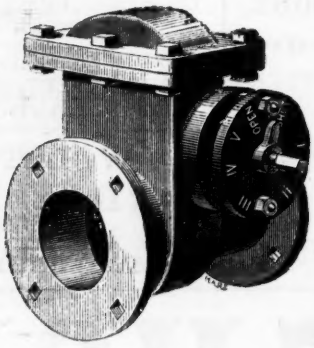
MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

REDUCED IN PRICE.

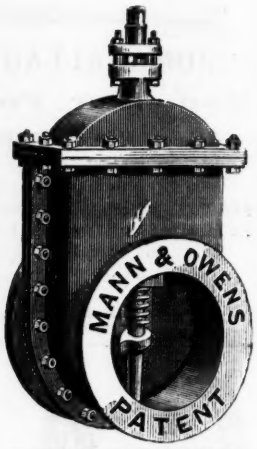
VALVE to OPEN DOWNWARDS.



BRIDGE VALVE
for Regulating the Seal
of Hydraulic Mains.



FULL-WAY RACK AND
PINION VALVE.



VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

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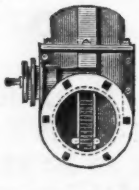
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS, of all Sizes.

GASHOLDERS,
AND
Gasholder Tanks.



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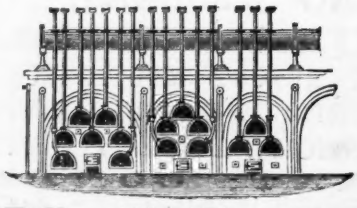
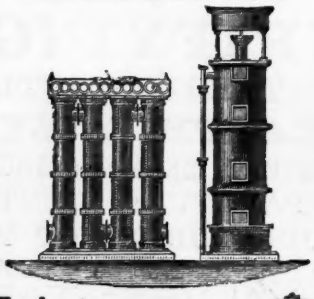
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates
and Tools, &c.



WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



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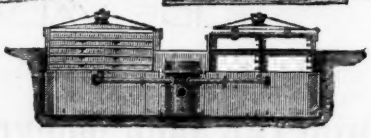
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

Telegrams: "GASOMETER GLASGOW."

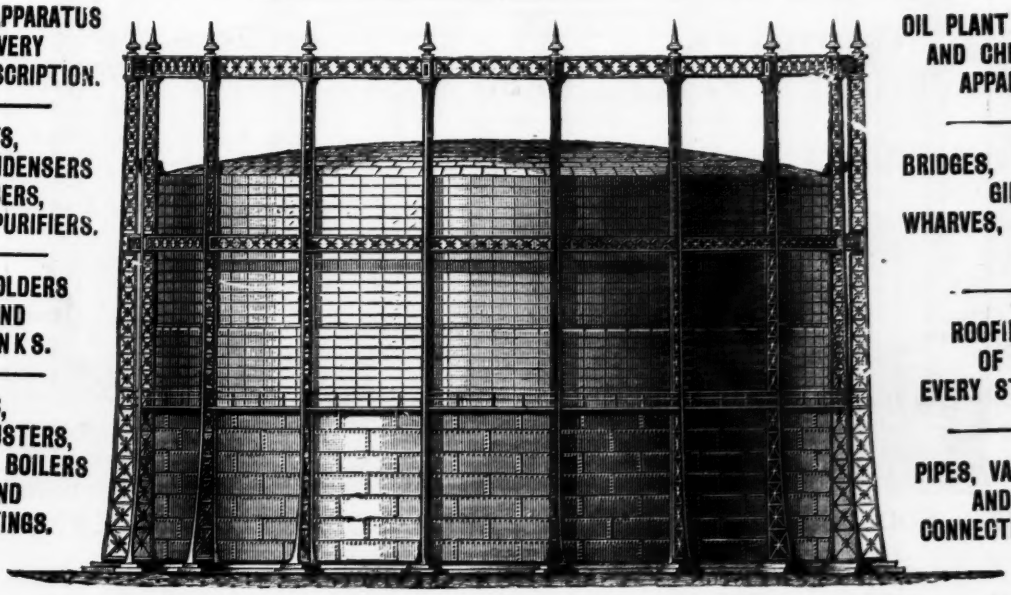
GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

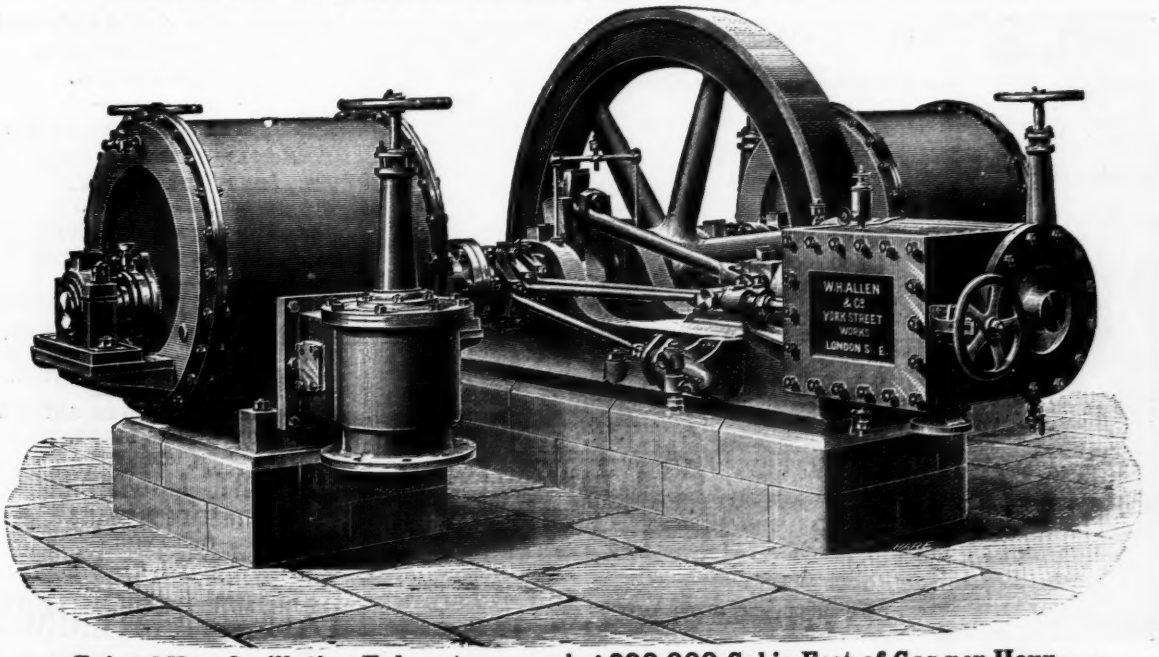
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

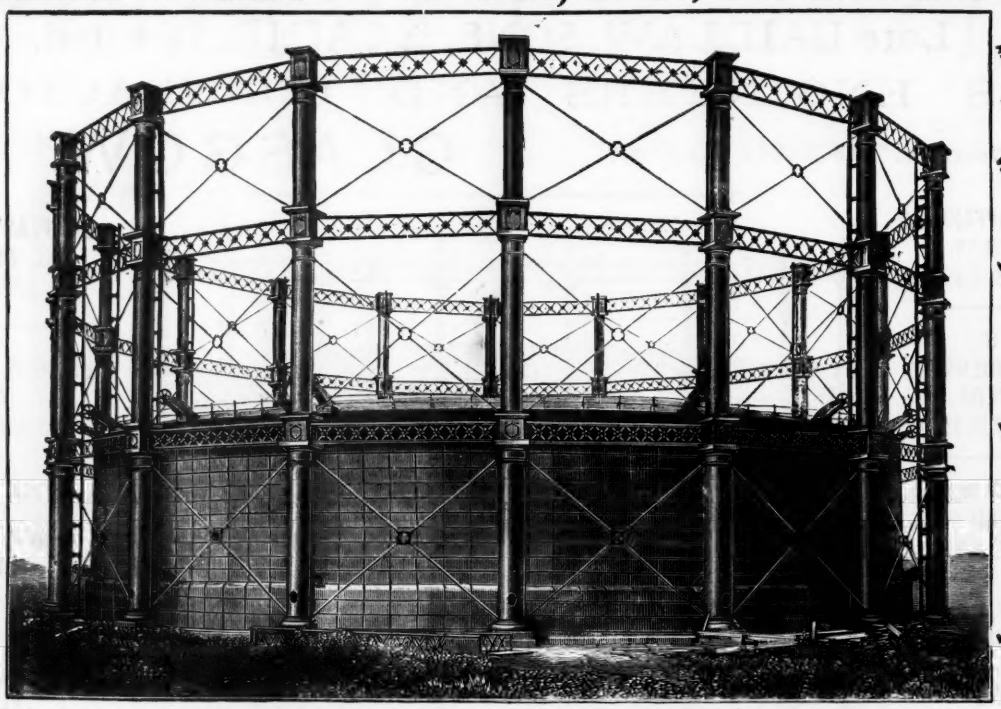


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

(Mr. JOHN WEST, M.Inst.C.E., *Managing Director*),

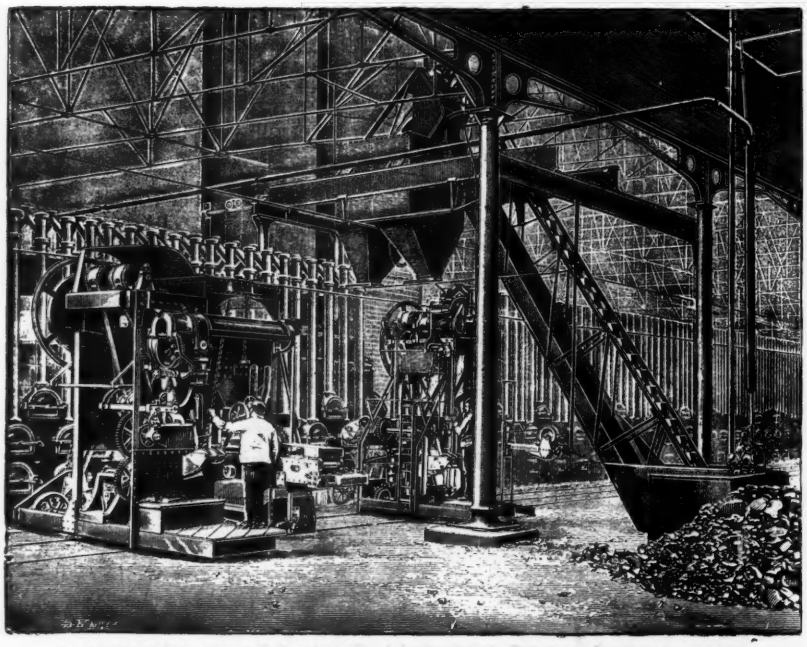
Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY.

COKE BREAKING, CONVEYING, AND WASHING MACHINERY.

OXIDE ELEVATING MACHINERY.

COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES WITH SELF-SEALING LIDS, FITTED WITH

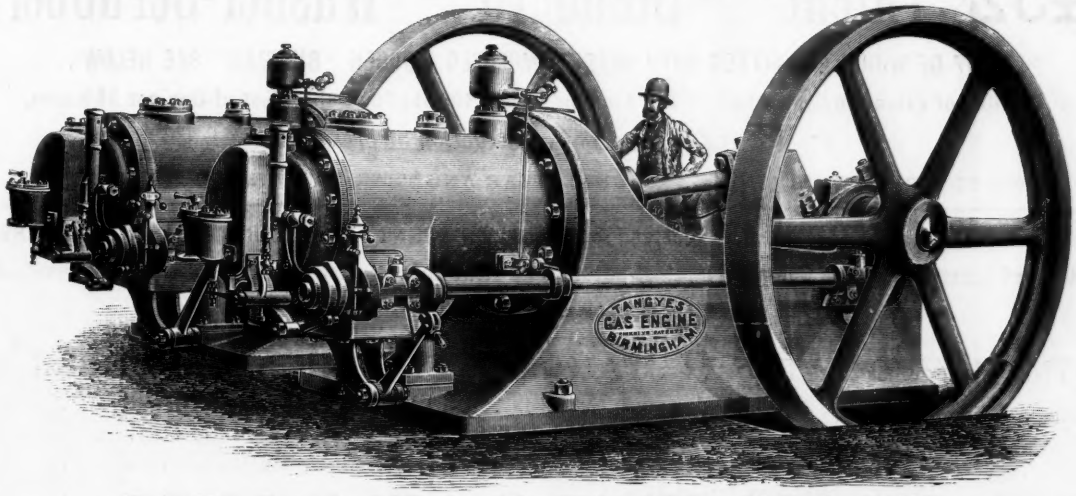
KING'S PATENT FASTENINGS.

N.B.—The whole of these Fittings are made of Wrought Iron.

TANGYES' GAS-ENGINE

"OTTO" PRINCIPLE. PINKNEY'S PATENTS.

Messrs. Tangye have laid down special Plant and Tools for the manufacture of these Engines, and are able by their system of MULTIPLE MANUFACTURE and of WORKING TO GAUGE to turn them out in the best possible style.



The 70-H.P. (Nom.) Coupled Engine, giving 172 Actual H.P., and indicating 200 H.P.
Single Engines from ¼ to 146 Actual H.P. (=170 Ind. H.P.) and Coupled Engines from 86 to 292 Actual H.P. (=340 Ind. H.P.)

APPLY FOR ILLUSTRATED AND DESCRIPTIVE CATALOGUE OF GAS-ENGINES TO

TANGYES LIMITED, BIRMINGHAM.

ALSO AT

LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA, BILBAO, and ROTTERDAM.

Telegrams: "TANGYES, BIRMINGHAM." No. 81 E.

MORRIS & CUTLER'S PATENT CONDENSER

IN USE AT OVER 70 WORKS.

NOW UNDER CONSTRUCTION FOR

COLCHESTER,
BELFAST,
BRAZIL,
HONG-KONG,
HARROGATE,
MANCHESTER.

CUTLER'S PATENT WATER-VALVES,

ESPECIALLY SUITABLE FOR PURIFIERS.

CUTLER'S PATENT GUIDE-FRAMING,

STRONG, SAFE, CHEAP.

EVERY REQUIREMENT FOR GAS-WORKS SUPPLIED.

16, GT. GEORGE ST., WESTMINSTER, S.W.

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL, LONDON.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[SIDNEY HERSEY Managing Director.] [J. CHANDLER, Engineer.]

452 Patent "Standard" Washer-Scrubbers

(107 OF WHICH ARE FITTED WITH PATENT IMPROVED WOODEN "BUNDLES" SEE BELOW),

Capable of extracting the whole of the Ammonia from 428,645,000 Cubic Feet of Gas per 24 hours,

Erected and In course of construction at present date.

WEIGHT IN MOTION, AND CONSEQUENT WEAR AND TEAR, REDUCED TO A MINIMUM.

The following List comprises the orders received for Improved PATENT "STANDARD" WASHER-SCRUBBERS constructed according to the Company's latest patent, and Renewals effected by the application of same to old pattern Machines.

67 IMPROVED PATENT "STANDARD" WASHER-SCRUBBERS, viz:-

Birmingham	5,000,000	Kilmarnock	1,000,000	Lyons-Vaise (France)	525,000
Beckton	3,500,000	Dover	1,000,000	Barry and Cadoxton	500,000
,,	3,500,000	Colchester	1,000,000	Workington	500,000
Kensal Green	3,000,000	Cambridge	1,000,000	Lowestoft	500,000
,,	3,000,000	West Bromwich	1,000,000	Newton-le-Willows	500,000
Liverpool	3,000,000	Luton	1,000,000	Manchester	400,000
,,	3,000,000	Alger (Algieria)	875,000	Erfurt (Germany)	400,000
Croydon	3,000,000	Valencia (Spain)	875,000	St. Chamond (France)	350,000
West Ham	3,000,000	Barcelona (Spain)	875,000	Santander (Spain)	350,000
Rochdale	3,000,000	,, ,,	875,000	Atlas Steel Works, Sheffield	250,000
Paris	3,000,000	Nice (France)	875,000	Bangor	250,000
,,	3,000,000	Stockport	800,000	Lille (France)	250,000
Glasgow	2,500,000	Magdeburg (Germany)	750,000	Melun ,,	210,000
,,	2,500,000	Altoona (U.S.A.)	750,000	Arles ,,	210,000
Manchester	2,500,000	Smethwick	750,000	Valencia (Spain)	200,000
Leicester	2,250,000	Schneider-Creusot Works		,, ,,	200,000
Swansea	2,000,000	(France)	735,000	Vercelli (Italy)	200,000
Bordeaux	2,000,000	Valparaiso (Chili)	600,000	Rawmarsh	200,000
Melbourne	1,500,000	Halle (Germany)	600,000	Baccarat (France)	175,000
Charlottenburg (Germany)	1,500,000	Elberfeld ,,	600,000	Hitchin	150,000
Derby	1,500,000	,, ,,	600,000	Sydney	100,000
,,	1,000,000	Nancy (France)	525,000	Balson-Chateauroux (France)	70,000
,, (Midland Rly. Works)	1,000,000	,, ,,	525,000		

RENEWALS TO 40 PATENT "STANDARD" WASHER-SCRUBBERS, viz:—

Birmingham	5,000,000	West Ham	1,500,000	Hampton Wick	500,000
Nine Elms (in part)	3,000,000	Nottingham	1,500,000	Kingston-on-Hull	400,000
Vauxhall ,,	3,000,000	Melbourne	1,500,000	Weston-super-Mare (in part)	400,000
Dublin	3,000,000	,,	1,500,000	Deventer, Holland ,, ,,	350,000
Shoreditch (in part)	2,500,000	Crewe (L. & N.W.R. Co.)	1,250,000	Enfield	300,000
Beckton	2,500,000	Beckton	1,250,000	Harrow	250,000
Manchester	2,500,000	,,	1,250,000	Buxton	250,000
Bromley	2,000,000	,, (in part)	1,250,000	Quebec, Canada (in part)	250,000
Pimlico (in part)	2,000,000	Bradford	1,250,000	Reigate	200,000
Plymouth	2,000,000	Maidstone	1,000,000	Newmarket	150,000
Cheltenham	2,000,000	Smethwick	750,000	Leominster	150,000
Croydon	1,500,000	Heywood	600,000	Kidsgrove	100,000
Edinburgh	1,500,000	Heckmondwike	500,000	Driffield	100,000
Hastings	1,500,000				

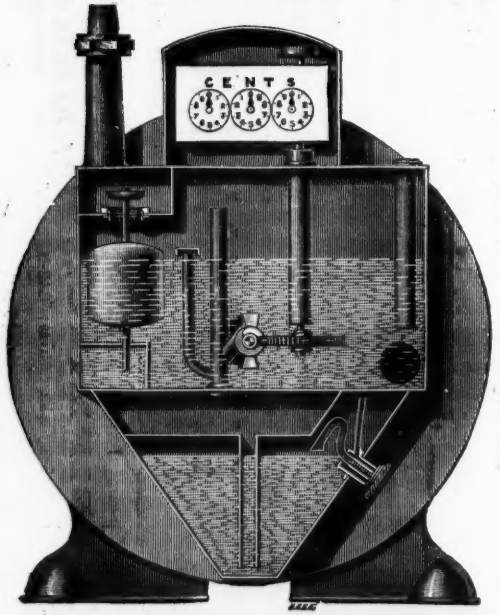
All New Patent "Standard" Washer-Scrubbers are fitted with the Company's Patent Improved Wooden "Bundles" or Washing Devices, which can be readily fitted to old pattern Machines.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, London, S.W.

THE SYPHON OVERFLOW

— Wm. Cowan's Patent. —

To suppose, as some do, that the main object of the "Syphon Overflow" is to promote the convenience of inspectors and others who "water" meters, is to misapprehend the chief purpose of the invention. That the convenience of inspectors is promoted by the Syphon Overflow is a fact that admits of no doubt whatever, because the watering of meters is thereby greatly facilitated; but it is a mistake to fix attention upon this result, and to regard it as the only one attained. To do this is to lose sight of the chief purposes the Syphon Overflow was designed to secure.



These purposes were—

1st.—The **speedy** attainment of **exactly the same water line** on each occasion of watering.

2nd.—The **absolute certainty** of this water line being attained.

3rd.—The **impossibility** of any water afterwards finding its way into the waste-box.

The first and second of these conditions secure the interests of the gas company, whilst the third greatly promotes the convenience of the consumer, for reasons that are well known.

Who that has had experience of Wet Meters does not know the disadvantages of the "Low Spout?" The slowness with which it adjusts the water line, and the patience required while this is being done, are matters of every-day experience. It is therefore no wonder that the "Syphon Overflow" is regarded as one of the most important improvements ever made in the Wet Gas-Meter. It is not only an important improvement **in itself,** but it possesses the property of making all previous improvements more valuable and effective. It has, indeed, made the Wet Meter a more perfect, and, in every way, a more satisfactory instrument.

Narrow views as to price often prevent the adoption of real improvements; but it would be a narrow view indeed which would prefer a "Low Spouted" Meter to one with a "Syphon Overflow," because of the trifling difference in the price of the two.

— W. & B. COWAN, —

ESTABLISHED 1827.

SMITH SQUARE WORKS, WESTMINSTER,
LONDON, S.W.
TELEPHONE No. 3250.
"DISC LONDON."

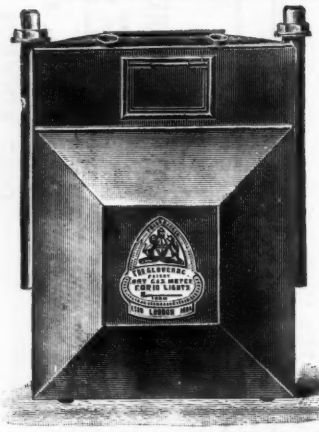
DUTTON STREET WORKS,
MANCHESTER.
TELEPHONE No. 1545.
TELEGRAPHIC ADDRESSES:
"DISC MANCHESTER."

BUCCLEUCH STREET WORKS,
EDINBURGH.
TELEPHONE No. 753.
"DISC EDINBURGH."

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

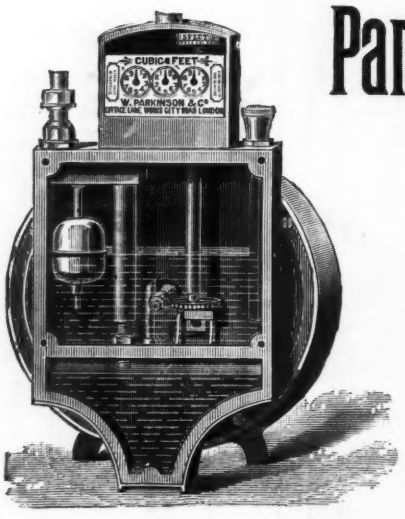
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	LEEDS:	MANCHESTER:
62, VICTORIA STREET.	3, BRIDGE ROW, DERITEND.	BOAR LANE CHAMBERS, 4, BASINGHALL STREET.	37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address*: "GOTHIC."	*Telegraphic Address*: "GOTHIC."	*Telegraphic Address*: "GOTHIC.

W. PARKINSON & CO.

ESTABLISHED 1816.

MANUFACTURERS OF WET METERS.



Parkinson's Cast-Iron Case Meter.

Works with very little friction.
Will stand very high pressures.
Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.
Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.
Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD,	BELL BARN ROAD WORKS,	OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
LONDON.	**BIRMINGHAM.**	**MANCHESTER.**
Telegraphic Address: "INDEX."	Telegraphic Address: "GAS-METERS."	Telegraphic Address: "PRECISION."

[See also Advt., p. 368.

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TO ADVERTISERS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 23, 1892.

The South Metropolitan Meeting.

THE South Metropolitan Company held their half-yearly general meeting on Wednesday last, when a considerable number of proprietors assembled, on one of the sultriest afternoons of the season, to hear the Chairman (Mr. George Livesey) discourse upon the affairs of the Company. It is by no means a light thing to give up the best part of a summer's afternoon to a shareholders' meeting at the Bridge House Hotel; and the fact that his audience grows larger every six months must be taken as an indication that Mr. Livesey's official orations are regarded as worth listening to, even by those not deeply versed in the subjects which usually form the stock of addresses of the kind. It would be vain to deny that some of the people who go into Southwark to hear Mr. Livesey talk, do so in order to take part, so to speak, in the "return "match" to the Horseferry Road fixture. And these are seldom disappointed. More than one directorial address, and one half-yearly report, would be altered in substance and intention if the South Metropolitan meeting preceded, instead of following, that of the Chartered Company. There is no particular reason for the established sequence of the two events; but so long as this continues, and the human nature of the leading men on both sides persists in asserting itself, so long will Chartered assertion and South Metropolitan rejoinder round off the history of the half year in the gas supply of London. On Wednesday last, Mr. Livesey was more than usually denunciatory of Chartered policy, which is saying something. He taxed the Horse ferry Road with mismanagement in the matter of the sale of anthracene in particular, from which, as he alleges, all makers of the article throughout the United Kingdom suffer. "Anthracene, some ten years ago," said Mr. Livesey, "was sold at 4s. and 4s. 6d. a unit; to-day, it "was only 9d. a unit. They were at the mercy of the "speculators in, and of the purchasers of, anthracene, "who seemed to be able to get it at any price they chose "to offer." This state of things, Mr. Livesey confessed, appeared to him to be very unsatisfactory. The question naturally arises in the mind of a hearer of such a statement, as to whether it is true; and if so, whether the result is necessary and irremediable.

Now it does appear to us a peculiar thing, not that the value of anthracene to the producers should have been so seriously affected—for market values are mysterious—but that anybody should feel justified in making public assertion of the imputation that the fact recorded in this instance is due to the action of a single producer. The facts in the case are that the producer whose action is thus canvassed makes by far the greatest bulk of the product; and that the product itself is a substance for which there is practically no substitute. Given the necessary demand for this article, therefore, and it follows that the producer might fix his own price for it, within wide limits. This is one inference which Mr. Livesey draws from the premiss as stated; and the other is that as The Gaslight and Coke Company have done nothing of the kind, therefore they are responsible for the deplorable results of the artfulness of the purchasers of anthracene in playing off one producer against another. It is practically impossible to prove to demonstration the correctness of the views taken of this matter by either party. Hunting for cause and effect in these commercial operations is a desperate enterprise. It may well be asked, however, how the reduction of the sale price of anthracene has benefited anybody; whereas we know that it has played havoc with the gas undertakings of this country. It is, moreover, a remarkable point in this controversy, that, if the impeached producers, The Gaslight and Coke Company, were to go into Court to-morrow to defend themselves against the charge of having wrecked the trade in gas-works residuals, they would probably not be able to bring forward as a witness to the contrary on their behalf one single gas manager who has to do with the working up of these products. We all know how highly the Governor of the Company esteems the example even of Corbridge, when it suits his purpose; but will anybody come forward in these columns—from Corbridge or anywhere else—to justify the Chartered Company's practice in the disposal of their residuals?

When this aspect of the gas-works residuals trade was on a previous occasion brought before the Governor of The Gaslight and Coke Company, he dismissed it by the *ad captandum* declaration that Mr. Livesey wanted producers to unite in a ring for forcing up prices, to which arrangement the Chartered Company could never stoop. But the answer to such pronouncements is that those who take part in any engagement must "play the game," or stand to be losers. There is no compulsion upon a Gas Company to undertake to work up residuals; but if this is done, it must be

just as another manufacturer would do it. There is a vast deal of cant talked about the immorality of syndicates and rings; but what are Gas Companies, that they should affect to despise every sort of regulated trading? The price of gas is regulated by statute, which protects gas makers from ruinous competition. All over the world, the same thing is done—if not by statute, then by extra-statutory agreement among producers. Take, for example, the production of Bath-stone—a unique product, not obtainable outside a limited area. Inside it, however, anybody could sink a pit and get the stone, which he could sell for what it would fetch. Unrestricted competition in the trade had its usual effect. Advantage was taken of the slightest natural superiority of access, working, or what not, to underbid the old producers, who retaliated at the cost of their reserves, until the trade was reduced to such a condition that it paid nobody. A cure came at last; but not too soon. The Bath-stone firms federated; and now the product commands a fair price. Examples of commercial federation, however, lie on every hand. We do not say that the same course would rehabilitate the trade in gas-works residuals; but we cannot see why it should not succeed. It will never be tried while the present men manage the two largest London gas undertakings; and it is, therefore, not worth while talking about, except as a suggestion.

The other principal topic of Mr. Livesey's speech was the effect of the Durham miners' strike, which raised the problem of stocking London with gas coal. In connection with this subject, Mr. Livesey made a remark which should set many of us thinking—in another capacity than as gas shareholders and critics. He said that if the Board for whom he spoke "had been told they should have to "face a cessation of the Durham coal supply for three "months, it would have caused them very grave anxiety; "and they would have been led probably to spend a "considerable sum of money in laying in a large amount "of coal"—both of which effects they were spared by the suddenness of the catastrophe. Truly, ignorance of the future is a condition of existence for which the wise man does right to be grateful. It is worth while to read this part of Mr. Livesey's speech in order to appreciate the thoroughness of his militant policy against the excesses of Trade Unionism. It used to be said of the traditional Irishman at Donnybrook, that his one idea was, when he saw a head, to hit it. So with the South Metropolitan Chairman—when he encounters a piece of Trade Union tyranny, whether it occurs at Newcastle, or Hull, or anywhere else, he refuses to "take it lying down." He hits back, and always heavily. It is not to be wondered at that, for this trait, the Labour agitators hate and fear Mr. Livesey as they do few other men of the so-called "capitalist" class. He is in their eyes like the animal described by the French naturalist as "very mischievous; if attacked, it defends "itself."

There are other matters contained in this lengthy speech to which we cannot now refer. No criticism of the Company's position was offered by the meeting, which appeared well content with the Chairman's statement.

The "Journal" and the Chicago Exhibition.

Evidence continues to accumulate in support of the acute observation that as the national character of the people of the United States develops itself with efflux of time, it increasingly leans towards the French, rather than to the British type. The statement may or may not be regarded as flattering to our Transatlantic cousins, according as the sympathies of the hearer incline. We mention the subject here merely for the purpose of endeavouring to set ourselves right with some of our constant readers and good friends on both sides of the ocean. Frenchmen, we all know, are as a rule exceedingly "touchy" upon many subjects of international discussion, and appear to be devoid of the sense of humour, as this faculty is understood in England. The gentlest "chaff" renders them furious. They take all raillery in the bitterest earnest, and seek for recondite motives in the lightest criticism that comes from foreign sources. Are Americans growing like this? It appears so, if we may judge from certain recent experience of our own. We take note of the gas affairs of the United States, just as we do of those of France (which in this respect means Paris), with no other possible motive than that of keeping our readers all the world over acquainted with every aspect and incident of that great industry which is one of the most truly cosmopolitan of modern occupations. This being so, it is rather amusing, but greatly more disappointing, to hear, as we are constantly doing, of all sorts of speculations in various quarters respecting the "reasons" which may be supposed to have induced us to make this or that comment in these columns. The funny thing about these subterranean grumblings is that the accuracy of our editorial statements, or the justice of our conclusions and criticisms, is seldom canvassed in them. When we describe as a monstrous blunder the Treaty under which the Paris Gas Company have arrived at their actual position, and pronounce this position to be a standing danger to the interests not only of the gas industry, but also to the more important principles of the sacredness of property and contracts, are these conclusions contested? Not at all. We are simply prayed to "return to an amicable attitude;" and there arises in some quarters the thought that, after all, the Russian system of Press censorship is not wholly inexcusable. And when we venture to condemn anything in the arrangements of the gas industry in the United States, it seems impossible for individuals who think themselves affected by, or referred to in, such observations, to treat them as possessing only a public and obvious bearing. Of course, these childish suspicions do not in the least affect the Journal, which is strong enough to be independent of all considerations save of what is due to the public interest and the interest of the gas industry. Difficult as it may be to the understanding of some people, we are as free to express praise as censure, and are not in the slightest degree solicitous to "shout "always with the biggest crowd."

As a good example of the wilful misunderstanding with which Journal editorials are sometimes read—not solely, we regret to say, outside the United Kingdom—the case of the proposed Gas Section at the Chicago Exhibition may be mentioned. It will be remembered that, after much vacillation, a Committee of American Gas Engineers, against whose competence for the duty nobody has breathed a word, undertook to organize a special gas exhibit at Chicago, after the Paris model, only better. There was from the first a question as to whether this movement would receive the support of the American Gas Companies as a whole, which question could not, of course, be answered in either sense before it had been asked. Well, the Committee set to work, and told the American gas industry that, if it wished to be specially represented at Chicago, the job could be done at a certain price. And the great American gas industry simply declined to pay up. Then, after it had become abundantly clear that the Committee would not be justified in proceeding with their programme, because the great question had evoked a negative, we ventured to advise them to "drop the matter "without making any more noise about it." Our reasons for offering this counsel are stated in the Journal for the 28th of June last; and they contain no hint of any worse opinion upon anybody concerned in the contemplated business than the expression that the thing should either be thoroughly well done or be left alone. For this innocent remark, which is ascribed to "sublime, though natural pre-"sumption," we are informed by an American print that if we will recommend that Americans should "go off some-"where, lie down, and die," perhaps we may, in a spirit of accommodation, be obliged, "for once only." The point of this complaint lies in the fact that the Gas Industry Council have had to do as we suggested—that is, they have abandoned their scheme through lack of support from those in whose behalf it was to have been carried out. This is nobody's fault, and whether it is to be regarded as a misfortune we are not prepared to say offhand. At any rate, we were not far from the mark in our estimate of the chances of the affair.

The Problem of Work and Wages.

It would be a very weak expression to describe the Labour War in the United States as "interesting." It is that, and very much more—how much, is by no means easy to state in proper language. Unless appearances are singularly misleading in this instance, we may see, in the rising of the steel workers, railway men, and miners of the affected regions, a movement to parallel which it is necessary to look some way back into universal history. There are strikes and strikes; but to call the American troubles by such a hackneyed and limited term, is to

display incapacity for reading the signs of one's epoch. All the newspapers are, of course, full of what is going on; and a considerable, if undefinable, allowance should be made for exaggeration of the items of news telegraphed from the disturbed districts. After all these statements have been prudently discounted, however, there remains a residuum of facts which possesses the gravest import. It is not so much the mere striking of workmen in the States for increased wages, or against reductions of wages, that arrests the attention of the thoughtful observer. There are hundreds of such incidents of industrial life in this country every year; and, as a rule, they terminate in due course without any serious rupture of the peace upon which the whole community rests. The present upheaval in America possesses a very different character from anything of the nature of a popular movement to which we are accustomed. As already remarked, it recalls those historical insurrections to which the portentous term Civil War has been applied by their chroniclers. Only, instead of being a warfare of political factions, this is an outburst of deep-seated discontent with the results that have ensued from the operation of conditions of existence which certainly did not originate with politicians or with rulers, and have nothing generically in common with forms of government. It is possible to argue that, in practice, the government of the United States is bad, whatever may be thought of its declared principles; and that the system of governing a country by the less reputable of its citizens can only result in aggravating whatever is radically wrong in the constitution of society, while it must be powerless for good. Even so, however, and assuming the professional politicians of the United States to be as great a curse to the country as is commonly reported of them, still they did not create the obvious causes of the present troubles. The social, industrial, and political institutions of the United States —using the last words in their widest sense—are, after all, the same as those of other civilized countries; and though M'Kinleyism doubtless makes the rule of "buying "cheap and selling dear" harder upon those who get the worst of the bargain, it is no new discovery.

Yet what do we see at the present moment in the very heart of the country which accepted M'Kinleyism as its economic gospel, and is preparing at Chicago to show the world the effects of this doctrine in operation? Not many weeks ago a Committee of Congress appointed to inquire into the results of recent legislation as bearing upon the cost of living in the States, docilely reported that there was a decided, if small, diminution in this regard. The report has now been strangely endorsed. It is rather remarkable that, in their comments on the state of things across the Atlantic, our own most irreconcileable "organs of public opinion," the *Standard* and *Daily News*, are for once in substantial accord. "From all parts of the "American Union signals of distress come, of which "these outbreaks are only the complement. Wages "have fallen everywhere, and the cost of living has in-"creased. The whole country groans in its chains, "and only half knows yet what it suffers from. But "the remedy will be forthcoming in time; and even "the American monopolist will soon acquire the know-"ledge that muck-rake wealth is wealth that rots in "the hand of its possessor, and that he is richest who "most freely shares his wealth with those around him." In the meantime, however, and while the population of the Great Republic has to try whether it has heart enough to sing about "the good time coming," we are told that "the chance for everybody in the New World has still "proved to be only a chance for the most gifted, the most "cunning, and the most resolute. Smartness gets its "reward, and the want of it that punishment which may "fairly be described as eternal. The Labour Unions, the "Granges, Alliances, Knighthoods of Labour, and what "not, are legion; and all of them show a profound dis-"satisfaction with the results of the scramble." To which of the antagonistic newspapers we have named the foregoing passages can be referred must remain a puzzle for our readers.

In concluding this necessarily meagre and unsatisfactory notice of the American industrial upheaval, we take the precaution of remarking that the failure of a country of such "magnificent possibilities" to solve the problem of work and wages is noted on this side with genuine disappointment. "It is to little purpose to say that America "is no worse off than her neighbours. If she is no better "off, she has distinctly failed." Time was when the puzzle of Ireland was attempted to be settled by the deporting of its population to the States; but the resultant troubles have proved to be as bad as the original difficulty. We wish we could point our Will Thornes and Keir Hardies to Transatlantic guidance out of the slough of Poverty; but it is only too certain that, in this matter, every nation upon earth must work out its own deliverance. King Solomon certainly knew how to do it—that is, if we may trust the statements of his chroniclers, who assure us that in his days the land of Judæa was so well off that the people despised silver as of no account. Unhappily, the secret has since been lost.

WATER AND SANITARY AFFAIRS.

THE three articles in *The Times* on "The Water Supply "of London," to which we made reference on a former occasion, and which appeared to constitute a complete series, have been followed, after an interval of nearly three weeks, by a fourth contribution, devoted to a consideration of the question, "What is the body, or what are the "bodies, to which London must look for a supply of water "in the future?" Articles "From a Correspondent," as these were, may be looked upon as tentative. But with the appearance of the fourth communication *The Times* committed itself by a leading article, adopting substantially the views expressed by its irresponsible contributor. To give greater prominence to the subject, the leading article stood first among the editorials of the day. The whole mass of letterpress—articles and leader—offered the same conclusions, namely, that London is on the verge of a water famine; that a fresh source of supply must be sought; and that the existing Companies are not to be entrusted with the new undertaking. What is to become of them was not rendered very clear, neither was any very decided tone adopted as to the particular authority that is to introduce the new era. The correspondent had no great admiration for the County Council, which he designated as a "garrulous incubus;" but he felt there was very little chance of superseding that body. *The Times* itself signified that "the treatment "of the question by the first County Council, which "appeared to be disinclined to give a just and proper price "for the Companies' undertakings, is not calculated to "inspire confidence." But where the requisite confidence is to be lodged is not indicated. Stress is laid on the necessity for immediate action. Something is to be done, and that "at once," or direful trouble may be expected. "An adequate supply," is called for; and the question ensues, "How is London to get it?" The answer comes in a couple of lines. We are to "assume" that a "suitable Welsh or Cumberland lake can be obtained;" and immediately the discussion is shifted to a consideration of "what body is to provide the supply." We are in the first place to "assume" that the hare is to be caught, and forthwith we are called to consider the question of cooking it.

The Times having spoken, what is the good of the Royal Commission? Why trouble Lord Balfour of Burleigh any further? It is declared that London must seek "new "collecting-grounds far afield, and lose no time about it." If the Royal Commissioners think otherwise, what does it matter? Their Assistant-Commissioner (Mr. R. E. Middleton) is exploring Hertfordshire, and is endeavouring to learn what quantity of water exists in that particular county. He has held a formal inquiry with respect to Watford and its neighbourhood; and though his future proceedings are not likely to consist in publicly marshalling witnesses to give evidence, there is perfect certainty that he will take the necessary steps to ascertain the facts of the case. Luton, in Bedfordshire, will very likely be visited, as well as Bishop's Stortford and other places in Hertfordshire. But Mr. Middleton may as well stop in Victoria Street if the whole question is to be settled *ex cathedrâ* in Printing-House Square. The Royal Commissioners have no power to go "afield," and see if they can annex a convenient lake in Wales or Cumberland. They have simply to say whether or not an adequate and suitable supply of water can be obtained in the Valley of the Thames. We shall be rather disposed to wait and hear what they have to say on the subject, before accepting the

dicta of *The Times*. That organ would have us believe that the Kentish wells are of small account; but a letter from Mr. Alexander Dickson, the Secretary of the Kent Water Company, declares that, so far as the wells and supply appertaining to that undertaking are concerned, there is no foundation whatever for the statement that the supply is "altogether uncertain." A long letter from Mr. G. B. Richardson, for thirty years a member of the Metropolitan Board, published in *The Times* of Saturday, objects strongly to the idea that the saturated chalk beds on the south side of the Thames are incapable of further demand being made upon them. We are by no means prepared to adopt Mr. Richardson's notion of a dual supply, in which the chalk water is to serve exclusively for personal use. But incidentally he brings forward some valuable evidence as to the enormous volume of water escaping from the chalk into the Thames and certain of its tributaries. Supposing Hertfordshire to be really as hard driven for water as its County Council represents, there is excellent reason to believe that the subterranean resources to the south-east of London are not easily to be exhausted. Their utmost value yet remains to be properly inquired into. But the river supply is taking a much more hopeful shape day by day. Some limit as to quantity may be imposed, so far as concerns a direct draught upon the open stream; yet the Thames has a far better capacity in this respect than is often declared by those who claim to be experts. Passing to the question of quality, we observe Dr. Frankland, in his last monthly report, using some remarkable terms in reference to the bacteriological examination of the river supply. Comparing the raw river water with that which proceeds from the filters of the Companies, Dr. Frankland describes the results as "highly interesting." He says that, if further observations confirm the inference that filtration through a few feet of sand can be made to render river water bacterially as pure as deep-well water, the fact "must have "a profound influence upon domestic water supply." To use an accustomed phrase, we thus seem to have arrived at a new point of departure. As to the quantity of water available for the supply of the Metropolis, Dr. Frankland has spoken out with sufficient clearness in the Sixth Report of the Rivers Pollution Commission.

The "Day" Gas-Engine.—The engine devised by Mr. J. Day, Assoc.M.Inst.C.E., of Bath, which was described in our "Register of Patents" on the 5th ult., was explained in a paper read by him before the Mechanical Science Section of the British Association at the annual meeting. The object sought to be achieved by Mr. Day was the combination in one motor of the advantages of the two systems now in use—viz., the impulse at every alternate revolution (the Beau de Rochas cycle), and the impulse at each revolution; and he claims to have done this, and at the same time produced an exceedingly simple engine. It is unnecessary to repeat here the description of it so recently given in our columns; but it may be pointed out that its characteristic feature is that, with one piston and one cylinder, an impulse is obtained at every turn of the fly-wheel. The engine will run with equal facility and efficiency in either direction. With regard to speed, Mr. Day stated in his paper that as many as 1100 revolutions per minute had been attained with a small engine; though at this speed, firing was irregular. At 500 revolutions, however, the explosions were absolutely regular. There is no friction with the engine, and consequently a high degree of mechanical efficiency is attained.

Excavating in Quicksand.—In a "Note" in the JOURNAL for the 12th ult., reference was made to the system employed by Mr. W. R. Kinipple for repairing leaks under tanks and wharf walls, &c. A somewhat similar method has been adopted by Mr. R. L. Harris for making excavations in quicksand; and it has been tried, by way of experiment, in the construction of a sewer in very treacherous quicksand at Providence (R.I.). The trench for the sewer was from 12 to 16 feet wide, and from 20 to 30 feet deep. On the line of the work, four 2-inch pipes were driven down to a level of 1 foot above the grade of the sewer. These pipes were 4 feet apart; and by means of a current of water through them, cavities were quickly swept out around their lower ends. When this had been done, a smaller pipe, fitted with a valve at its end, was slipped down each of the 2-inch pipes. When this pipe projected below its main pipe, there was a free passage for fluid either up or down; but when it was drawn up a little, no fluid could go in an upward direction. The cementing fluid, being forced through, formed a solid mass with the sand. When the excavation of the trench reached this point, a solid stone-like slab, about 6 inches thick, was found connecting the points where the cement had been injected. Beneath this, and parallel to it, were thin sheets of cemented material.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 338.)

THINGS have been very dull in the Stock Exchange during the past week: but this can hardly be wondered at. There was no active depression, however; and, on the whole, the outlook is fair. The chief factors to prevent absolute stagnation were speculation as to who was to be the new Foreign Secretary, and Lord Rosebery's accession sent Egyptians up; the labour troubles in the United States, which sent Americans down; and the depression in silver, which is far and wide reaching in its influence. The Money Market is quite without change; and there is no foreseeing when the present rate will be superseded. The Gas Market, on the whole, has been very quiet; only one or two stocks being really active. The tendency, however, continues excellent; and all changes in quotation are still in the upward direction, with only one exception, which is attributable to special causes. Gaslight "A" rather hung fire at first; opening with a solitary bargain done "specially" as low as 212. It soon commenced to mend, however, and finished off with 216 done two or three times; the quotation showing an improvement of 2. The secured issues of all sorts—debenture, preference, and limited—were in good demand, owing to the general request for superior securities for investment; but although very good prices were obtained for them, their quotations stood still. There was not much done in South Metropolitans; but they made a further advance in value. The "A" was naturally the chief gainer; the good prospect held out of a maintenance of the dividend being largely in its favour, as it has most to gain from an increase, and most to lose from a reduction of the rate divided. Nothing at all was done in Commercials. The Suburban and Provincial Companies are without any feature whatever; and quotations remain absolutely unchanged. The Tottenham and Edmonton Company's accounts show that, after paying fixed charges, the earnings of the half year are only about £900 short of the amount required to pay their old rate of dividend, which is pretty good as times go. The Continental Companies' stocks continue to fetch good prices; but the only advance in quotation is in Union. None of the rest exhibit any change, except Monte Video, which is 1 lower. Water stocks are mostly steady, though Southwark and Middlesex are slightly lower.

The daily quotations were: The Gas Market was very quiet on the opening day, and nothing moved either way. Tuesday was more brisk; and prices were better. Gaslight "A" advanced 1. Wednesday relapsed into quietude; but the upward movement in quotations was pursued. South Metropolitan "A" went up 2; and ditto "B" and Continental Union, 1 each. Thursday was chiefly noticeable for the demand for Gaslight debenture stocks. South Metropolitan "A" made a further advance of 2; but Monte Video fell ½. In Water, Southwark receded 2; and West Middlesex, 1. Friday was the busiest day of the week, especially in Gaslight "A," which rose 1 higher. Saturday was fully as quiet as usual; and the only alteration was another fall of ½ in Monte Video.

ELECTRIC LIGHTING MEMORANDA.

A Newspaper "Interviewer" on the St. Pancras Electric Lighting Scheme—The Vestry of Islington and the Electric Light—The Price of the Electric Light in "Clubland."

MR. ECCLESTON GIBB, the Vestry Clerk of St. Pancras, has for many years been an important man in the parish; but he is now having notoriety thrust upon him from a new quarter. He occupies the unique position of mouthpiece of the only Metropolitan Local Authority which has established a central electric lighting station; and he is accordingly the by no means unwilling recipient of the favours of the interviewing newspaper reporter who has an order to find out how municipalized electric lighting works in practice. It is remarkable how the reputations of local authorities are made and unmade. Not so many years ago the Vestry St. Pancras and all its doings were subjects of popular execration, as examples of rampant "parochialism." It is hardly too much to say that when Londoners of the past generation read their Dickens, and fell under the magical influence of the author who created the immortal Bumble, very many of them would have fixed the scene of some of the moving incidents in "Oliver Twist" in St. Pancras. Perhaps the gentlest way to describe the old reputation of the St. Pancras parochial authorities would be to say that their way of administering the affairs of the parish did not greatly redound to the credit of the principle of local self-government. All this, however, is now changed. The *Pall Mall Gazette* the other day commenced an article upon the electric light in London, which purported to be the gleanings of a talk with Mr. Eccleston Gibb, with the remark that "It does not fall to the good fortune of every London ratepayer to have his municipal matters managed by such an enterprising and progressive Vestry as that which holds sway at St. Pancras." The occasion for the passing of this panegyric is simply the venture of the Vestry into the speculative field of electric lighting. As to this conduct of the Local Authority, which is of

course "progressive" and "enterprising," and all the rest of it, the reflection occurs to one that just as it is easy for kings to be brave with the blood of other people, so the gentlemen who control the rates may well be enterprising with public money in the matter of electric lighting, albeit they might not particularly care to venture their own in an electric lighting company. However, not to be captious in denying to Mr. Eccleston Gibb all the credit due to the "untiring energy and zeal" of this "deservedly popular Vestry Clerk," as his somewhat sycophantic reporter calls him, may we not be permitted to remark that it is just a little too soon to advertise the "magnificent results" of a municipal electric lighting experiment which has hardly begun to pay off its capital indebtedness? It is all very well for a newspaper reporter to write about the splendour of the 2000-candle power arc lamps which replace a few of the street gas-lamps in the brilliant Tottenham Court Road; and to refer contemptuously to the "paltry flicker of the humble gas-jet" thus eclipsed. But there is a good deal of "French measurement" about the whole of these St. Pancras electric lighting reports; and we shall wait patiently to see how they stand the test of time.

The Vestry of Islington appear disposed to follow the example of the neighbouring Vestry of St. Pancras, and to apply for an Electric Lighting Order with a view to the carrying of it out on their own account. The Islington Authority have been moved thereto by a report of Professor Henry Robinson, who did the St. Pancras job, and who now assures his next customers that incandescent electric lamps served at the standard municipal price of 6d. per unit will cost about the same as gas at 3s. 1d. per 1000 cubic feet. Our outspoken contemporary, the *Electrical Review*, declares, however, that Professor Robinson's estimates are, to say the least, "too sanguine." By this remark we take it that our contemporary leaves it to others to state that Professor Robinson's advice to the Islington Vestry is positively misleading. The *Electrical Review* is, by the way, a sore trouble to the touting electricians, who go up and down the country assuring provincial local authorities that electric lighting is much cheaper than gas. It tells the truth upon this point, which is just what these advertising gentry cannot endure. They proceed upon the assumption that if by barefaced lying they can succeed in inveigling a public body into starting an electric lighting plant, they are practically safe; for though the imposition must be discovered sooner or later, they know that, after the plunge has been taken, their patrons will become their accomplices, and will be as anxious as themselves to keep the facts from public knowledge. In the present case, our contemporary observes, "With regard to the relative cost of gas and electricity, Professor Robinson says that the cost of the electric light is about the same as gas (which costs 3s. 1d. per 1000 cubic feet) when the current is charged at 5d. per unit. The data on which he makes this comparison are that a flat-flame burner giving 12 candle power burns 4·6 cubic feet of gas per hour, and that a 16-candle power incandescent lamp requires 56 watts to maintain it at this candle power. Now even if we accept these figures, the result is not so favourable to electric lighting as stated in the report, since the cost of gas (at 3s. 1d. per 1000 cubic feet) is 0·23d. per hour for 16 candles, while the cost of electricity (at 5d. per unit) is 0·28d., to which the report rightly says should be added 0·045d. per hour for lamp renewals. But one may well ask where is the incandescent lamp which will give 16-candle power for 56 watts during a life of 1000 hours." Taking the most favourable published tests of the efficiency of incandescent lamps, it is found that, instead of 3·5 watts per candle, we must take 4·25 watts if the lamps are to last for 1000 hours; and this with electricity at 5d. per unit, and without allowing for renewals, will bring the cost for current alone to that of gas at 4s. 7½d. per 1000 cubic feet. Our contemporary goes on to show that, for incandescent electric lighting to be equivalent in cost to gas at 3s. 1d. per 1000 cubic feet, including renewals, the current ought to be supplied at about 2¾d. per unit. A protest is also made against the folly of under-estimating the cost of electric lighting, which concludes with the words: "It would surely be far better to quote figures about which there can be no doubt, so that vestries and other public bodies may not be disappointed of the results promised them, and to rely on the undisputed advantages of electric lighting from the point of view of cleanliness and convenience, to make up for the disadvantage of its greater cost as compared with gas." With this observation, we heartily agree.

The concurrent systems of electrical supply favoured in the case of London districts by the Board of Trade—that is to say, the sanctioning of an alternating high-tension service from a distant source in the same area with a localized constant current supply—may work well enough as an example of regulated competition, but it leads to some unpleasantness between the rival partisans. Not long ago a grave impression was created upon the public mind by the news that the consumers of light in the heart of Clubland—the richest and most luxurious town area in the world—had been moved to protest against the costliness of electric lighting. It was felt that this means of lighting must be very expensive indeed if the Sybarites of St. James's could not pay without grumbling. The managers of the central station supply companies implicated by this expression of dissatisfaction felt that the reproach was a serious one, and did their best to meet it. In one instance, at least, the price of the unit of electricity was immediately reduced. This was evidently not enough, however; and while the localized companies were trying to meet their customers, their competitors from a distance tried to improve the occasion by underbidding them. Last week, the Manager of the Westminster Electric Supply Corporation (Mr. Bax) wrote to the newspapers a letter intended to be read as a sequel to the memorable clubmen's protest. He tells how one club in his district fell into the snare spread by the iniquitous interlopers, and received due punishment in the form of "a total extinction of some ten minutes' duration." This is very dreadful; but it is a dangerous thing for one electric light dealer to twit a rival in trade with an accidental extinction. An old proverb about the pot and the kettle is suggested by this kind of recrimination. The Westminster gentleman concludes his epistle by stating that "failures in the past have done much to check the progress of electric light, and to bring it into disrepute. The endeavour to meet the demand for cheapness has frequently been the cause. But consumers are now beginning to prefer reliability to cheapness; and they find that the former is readily obtainable if a fair price is paid." There is something approaching the sublime in the presumptions of these sentences; and we shall endeavour to bear Mr. Bax's claims in mind against the time when the malignancy of Fate and circumstances overtakes the Westminster Company. Whenever this happens, the Company's good neighbours and rivals will not omit to publish the fact.

THE PRICE OF GAS, AND GAS-STOVES.

In discussing last week the latest suggestion for curing the black fogs of London, we made passing references to several points arising from the broad general proposition to supply the Metropolis (and, of course, other densely-populated localities) with fuel in the gaseous form. Some of these matters will repay further consideration; and we also desire to take more particular notice than we have yet been able to do of the manner in which the suggestion has struck the *Lancet*, which frequently sheds the light of medical criticism upon contemporary notions. In the first place, it is well to remark that when Mr. Lynn C. D'Oyle and the *Lancet* speak of supplying London with gaseous fuel, they mean ordinary coal gas. Too often, when this idea is talked about, speakers who pretend to breadth of view wind up their observations with a vague remark to the effect that there are cheaper kinds of gas, as good as common coal gas for heating purposes, which might be distributed at a very much lower cost. It is this sort of generalization which desolates the field of controversy. The uninstructed public are caught by these apparently profound statements, and only the few know that they are more muddy than deep. It is hard to persuade a popular audience that coal gas is in reality, when regard is had to its calorific value, the cheapest kind of gaseous fuel at present available for general distribution in towns. Those who take this view, and expound it with all the forcible reasons which unquestionably exist for it, are quickly brought face to face with the patent conclusion which stands paramount in the estimation of the consumer—that coal gas is too high-priced to come into extensive use as a fuel for all purposes. Hence, if coal gas is the only possible gaseous fuel, how is the obstacle of its price to be overcome?

It may seem like throwing cold water upon a project which, if it could be carried out, would be highly beneficial to the community; but the truth must be told. There is not, so far as we can see into the future, any indication that coal gas will ever be much cheaper than it is to-day. Of course, we cannot pretend to any authority in the way of prophesying; and we prefer to leave this kind of performance to our friends the electricians, who never tire of it. These gentlemen think nothing of repeating the assurance that, while electricity is to be the "light of the future," gas will be the future fuel. We cannot accept this off-hand vaticination as either probable or comforting. Unless the actual roundabout method of generating electricity for lighting purposes is materially abbreviated by the discovery of that long looked-for short cut—the direct conversion of the energy of fuel into electricity—electric lighting cannot be cheapened by other than commercial considerations. If the colossal blunder of the Paris gas concession were repeated in the case of electric lighting, and a price were fixed for the latter with the sole proviso that it should be decreased in the event of the discovery of any improvements in production tending to lower the cost, there is little reason to suppose that the result would differ from that manifested in the case of the Paris Gas Company. Commercial influences may affect the selling price of electric lighting, just as they have done that of gas wherever they have been allowed to exercise fair play. It is possible, moreover, that the influences capable of favourably affecting the cost of gas making are not yet exhausted. Besides the beneficial effects of the aggregation of improvements in working, small in themselves, which Time has yet in store for the reward of the patient technician, there is the influence of an enlarged day consumption of gas, which shares in itself the natures of cause and effect. After due weight, however, has been given to all this order of considerations, which fall, so to speak, upon the credit side of the gas industry of the United

Kingdom, there remains to be faced the tremendous debit influences. Gas coal is never likely to sell again for the lowest prices that have been paid in the past. Its quality is more likely to fall off than to improve; and what used to be regarded as the best gas coals—the cannels that could always be relied upon at a pinch—are no longer available. The next great charge upon the gas industry—the labour—is growing dearer every year, not only on account of increases in the rate of wages paid, but also because of the reduction of tasks. The cost of gas manufacturing and distributing plant, being affected by the value of fuel and labour in the contributory industries, will rise rather than fall. It may be urged that cheaper, less laborious ways of making gas may be expected to appear upon the scene, as the conditions of the time press ever more and more severely upon the old methods; but we have no faith in this class of promises. Gas making by machinery sounds like progress; but good hand work of the kind that is growing rarer every year, will compare favourably with the best possible machine. Indeed, it is not the superiority of the machines, but the unreliableness of the men, that is slowly, but surely, bringing the former to the front. By-and-bye there will be no getting the gentlemen of education, culture, and refinement, of whom the male population of these islands will consist, to stand retort-house work for eight hours, or even for four hours a day. It by no means follows, however, that gas will be cheaper when made by engine-drivers instead of stokers.

Upon a review of the position and prospects of the coal-gas industry, therefore, it may be reasonably concluded that the influences which tend to enhance the price of gas more than counterbalance those which may be expected to cheapen it. Moreover, the latter are limited; and their range is capable of precise definition. It is easy, for example, to take the case of any particular gas undertaking, and compute the price at which the product could be sold if the day or summer consumption bore a prescribed equal ratio to that of the night or the winter, and if the business were conducted in all respects in accordance with the best practice known to that miracle of prudence, the "hypothetical tenant." If it is said of a gas-works that the carbonizing work shall never vary, winter and summer, and that everything shall be done in agreement with the worthiest models of management and administration, the price at which gas must be sold to pay a certain return upon the invested capital will be a minimum. But there is no limitation to the adverse influences which may operate upon such an undertaking through the price of coal, the cost of labour, and the value of residuals.

Let us deal with the last consideration by itself, as it has not been discussed. Is the value of all the residuals of coal-gas production, taken together, likely to rise or fall? As for the coke, this might be expected to bear a pretty constant ratio to the value of coal. It will always be worth less in the English market than its actual fuel value would appear to deserve, because it is dirty in comparison with the best coal, and is less manageable when but little heat is required. Apart from coke, however, there is small chance of any other gas-works residual improving in value. Tar and ammonia are procurable from more than one source; and a sufficient rise in the cost of coal will bring into the market an overwhelming supply of cheaper raw nitrogenous materials. On the whole, therefore, it is rational to incline to the belief that the problem of the immediate future in coal-gas manufacture will not be that of materially reducing the selling price, and securing corresponding dividends, but rather of keeping to something like current values. And it will not be surprising if, in order to effect this object, and to confer the greatest benefit upon the greatest number of consumers, some alteration has to be made in the statutory requirement as to candle power.

Thus the question remains as we first stated it: If ordinary coal gas is the only available form of gaseous fuel, and if this gas can only be sold at or near current prices, which are too high to permit of its general use as fuel, where is the future for it? In the use of a necessary of life which costs too much money to be utilized as freely as one would like, there are obviously two things to be considered: First, are we getting it at its lowest cost; second, are we making the best of it? In the case of ordinary coal gas, we have already answered the first of these questions. With regard to the second, an answer need not be long delayed. We do not think that the last word has been uttered for gas heating-stoves. Gas for cooking has been pretty well worked up. The conditions under which gas can be satisfactorily employed in culinary operations are by no means recondite; and the chief obstacle in the way of the universal adoption of gas-stoves for cooking, wherever the price of gas is not more than 3s. 6d. per 1000 cubic feet, is not so much the defects of the apparatus as those of the cook. The opportunities for waste of gas in the most perfect stove are so many, that it demands more forethought and self-denial than the average domestic is endowed with, to avoid burning gas extravagantly. The vagueness of the prevalent notions respecting the construction and working of gas-stoves is well illustrated by one passage in the article in the *Lancet* referring to these devices. It runs as follows: "Nothing can be more injurious than the imperfect products of combustion arising from faulty gas-burners; and where air is admitted, as in an ordinary Bunsen burner, the arrangement by which the exact proportion of air is regulated is very liable to get out of order *unless it is frequently examined*." The italics are ours. Readers of these pages hardly need telling that the air and gas inlets to any atmospheric gas-burner which is sent out from the works of a respectable maker, are the most unalterable parts of the apparatus; being absolutely without wear and tear in the ordinary way. "Frequent examination" of such burners, at the hands of the consumers, would be likely to result in more harm than good, if the apparatus were to be taken to pieces for the purpose; and otherwise an "examination" of it must be a very perfunctory performance. The proper working of an atmospheric burner, and the prevention of its lighting back, are matters that rest with the maker, not with the user. The popular delusion that there is any particular virtue in the proportion of air admixed with the gas is more likely to be fostered than weakened by expressions like those of the *Lancet* article.

The fact of the matter is that there is a kind of "fatal facility" about the atmospheric gas-burner which has led to the production of an infinite number and variety of bad, extravagant gas-stoves. It would really appear as though the regular "wheeze" of the sale-rooms, that an atmospheric gas-flame must be less expensive than a flame of plain gas, "because of the air that is burnt with it," had become an article of belief with the majority of makers of this class of goods. It is hardly too much to say that if the atmospheric gas-burner had not been known to the trade, the market would have been filled with better stoves at the present day. An atmospheric gas-flame can be combined with cast iron, fire-brick, and asbestos into a "gas heating-stove," which sells for a few shillings, and makes the "wheels go round" in a meter with an energy altogether disproportionate to the warming effect of the arrangement in an ordinary apartment. It is well the makers of these arrangements for burning gas to the worst possible effect advise that they should be put under a chimney with a good draught; for the smell of acetylene, which is a tell-tale of the amount of unconsumed gas passing off, would otherwise damn the whole thing. There is a good deal of nonsense in the oft-heard caution that all gas-stoves, whether for cooking or heating, should be provided with special means of ventilation. People think nothing of burning a four or five light pendant all the evening in a small unventilated room, while they carefully put the "gas-fire" under the chimney, oblivious of the truth that the one arrangement should need neither more nor less ventilation than the other. Unfortunately, the proper way to utilize the radiant heat of a luminous gas-flame, as well as the heat of the products of combustion, is a more difficult thing to find out than how to knock up a sham gas-fire. A good recuperative lamp is the most efficient gas-stove yet made; but nobody converts an apparatus of the kind into an attractive article for the chimney-place of a modern room. No such appliance could compete in point of first cost with a rubbishy "gas-fire;" but if gas companies and gas committees of corporations did their duty, and encouraged inventors, instead of being content to play into the hands of makers of gas-stoves intended only to sell, the ultimate economy of the best article would not long remain in doubt.

Coal-Tar Products in Germany.—In a recent issue of *Nature*, Professor Meldola reviewed a work by Drs. Schultz and Julius on the subject of "Coal-Tar Colouring Matters." Although the book is nothing more than a tabulated catalogue of coal-tar derivatives, it is in reality, he says, a complete index, up to the date of publication, to the literature of this rapidly-growing branch of industry. The first edition was published in 1888, and contained 278 colouring matters; the present one contains 392. Referring to the tables, Professor Meldola says: "One very forcible truth which is brought home is the great preponderance of references to patents—chiefly German. It is evident that the chemist who wishes to keep abreast of modern discovery can no longer afford to neglect the literature of the Patent Office. Many discoveries of the greatest scientific importance are buried in these specifications; and it is long before they find their way into the text-books. This, so far as we are concerned, is much to be regretted, for, in the first place, the working chemist is already painfully overburdened with literature; and, in the second place, the statements in specifications require very judicious sifting before they can be admitted as part of scientific knowledge. So far as English technologists are concerned, it is to be regretted that such an overwhelming majority of German patents have to be referred to. This, of course, is only to be expected when we consider the extraordinary activity which the Germans have displayed in the development of the industry of which the foundations were laid in this country 30 or 40 years ago. . . . This is the fruit of technical education in the true sense. No system of cramming for an examination, no method of orthodox 'test-tubing,' not even the 'recreative institute' line of technical training, which is so much in vogue at the present time, will enable us to recover our lost position in this or in any other branch of chemical technology." As bearing out Professor Meldola's remarks on the excellent training received by German chemists, we quote the following sentence from an article on "The Chemical Industry in Germany," in the current number of the *Board of Trade Journal*: "Germany's chemical industry takes a high place, and its products are forwarded to almost all countries of the world. The reason for this extension is to be found in the high theoretical talents of the German people, and the excellent schools which year by year furnish a body of educated chemists to advance the trade of the country."

NOTES.

A Gas-Oil Lamp.

A curious description of gas generating petroleum lamp has been invented by Mr. L. Sepulchre, of Herstal, Belgium; the nature of the device being a mechanical expression of the truth first enunciated by Faraday, that in a luminous flame supplied by a wick there is, in effect, a gas-making operation in progress. If only a small portion of the exposed wick of a mineral-oil lamp could be caused to ignite and burn without communicating flame to the remainder of the wick, the effect would be that its flame and the heat resulting therefrom would cause a distillation of the oil continuously rising to the top of the rest of the wick. It is further conceivable that these vapours of hydrocarbons could be led off by a suitable pipe to a distance, and there be ignited and burnt. Mr. Sepulchre accordingly proceeds by keeping the focus of distillation at the wick at as low a temperature as possible by converging air-jets; the ultimate focus of combustion of the hydrocarbon vapours thus generated being removed to a distance from the wick, and above the metallic deflectors. For lamps intended for heating purposes, this focus of ultimate, or intense, combustion is placed at a considerable height above the deflectors; the parts of the lamps which contain, or are in contact with, the oil being thus kept cool, and the whole arrangement rendered very safe. The wick, being removed from the real point of combustion, does not get charred, and consequently lasts longer, and acts more regularly than wicks of ordinary lamps. Moreover, only a very small proportion of the oil consumed is required for the gas-generating process, and the remainder is burnt to the best possible advantage. Mr. Sepulchre claims that by thus vapourizing most of the oil consumed, he obtains a considerable saving per unit of light or of heat developed, together with complete absence of smell and smoke.

An Aluminium Light.

Although the possibility of obtaining a brilliant light by the combustion of some finely-powdered metals is recognized as a commonplace of the chemistry lecture-room, hitherto only powered magnesium has been practically employed for this purpose, because it is the only metal which burns brilliantly in air. Convenient supplies of oxygen, however, have induced photographers and others to endeavour to utilize this agent for the production of flash-lights from cheaper metals than magnesium. In this way, it has been found that powdered aluminium can be burnt to as good effect as magnesium, while it is not only considerably cheaper, but also burns without smoke. This aluminium light is not quite so actinic as magnesium light; but it is nearly so. The powdered aluminium cannot be satisfactorily burnt in an ordinary spirit-lamp; but the best result is obtained by using such a lamp fitted for receiving in the middle of its flame a supply of oxygen, and into which the powdered metal is simultaneously projected by means of a compressible india-rubber ball. The best light was secured by burning in this way a mixture of 100 parts of finely-powdered aluminium, 25 parts of lycopodium, and 5 parts of ammonium nitrate.

The Divining-Rod at the Society of Arts.

In the course of a series of Cantor Lectures upon Mine Surveying, delivered before the Society of Arts, Mr. Bennett H. Brough made some remarks upon the use of the divining-rod for discovering water springs and metallic lodes, which he said is still much greater than educated people would be likely to suppose. It is somewhat startling, however, to be told that numerous forms of dividing-rod have actually been patented of late years. Notwithstanding the fact of the use of the rod having been sanctioned by the Grantham Union Sanitary Authority and the Northamptonshire County Council, Mr. Brough has no hesitation in declaring that "the phenomena presented by it must be regarded as being due to self-delusion, deliberate deceit, or involuntary mendacity." He gave ample references to the bibliography of the divining-rod, which is somewhat extensive, and exhibited a speciman of the appliance. It is interesting to note that there is what may be called a legitimate development of the idea of the divining-rod in the dipping magnetic needle, largely employed for the discovery of iron ore deposits in Sweden and the United States. This, of course, is a scientific procedure, and does not apply to searching for water, in connection with which the superstition of rhabdomancy has been brought under our readers' notice.

"Gas and Its Applications."—If any section of the public are still unacquainted with the various uses to which gas can be applied, it will be simply owing to a determination not to avail themselves of the information which is now so freely put before them in the shape of leaflets and pamphlets setting forth its capabilities. One of the latest of these is the production of Mr. R. C. Bishop, Secretary of the Christchurch Gas Company, who has compiled from the best authorities a quantity of information as to the application of gas for illuminating, domestic, and industrial purposes, which, combined with the results of local experience, he has brought together in a neat pamphlet having an artistic wrapper, and bearing the above title. Mr. Bishop's work would be found useful outside the sphere for which it was originally undertaken.

COMMUNICATED ARTICLE.

SHALL WE UTILIZE THE LATENT ABILITIES OF THE MANAGERS AND WORKMEN ENGAGED IN GAS-WORKS?

By Gilbert Little.

Mr. George Livesey, Mr. Foulis, and other prominent personalities connected with the gas industry, have, we all know, given attention to, and formulated, schemes to stimulate the interest of the workmen. In bringing this question, therefore, before the readers of the JOURNAL, I am so sensible of its importance that my only hope of arriving at its solution depends upon receiving, not only sympathetic assistance, but also the most cordial appreciation of the difficulties inherent in such an inquiry; and, moreover, with a predisposition on the part of engineers and managers to prosecute that inquiry in a spirit at once bold and generous. The scheme which I purpose submitting for consideration is not, in principle, altogether novel. In a limited form it has already been tried, with excellent results, in a great engineering establishment wherewith I am proud to have been connected; and to the partners of that firm belongs the honour of making the experiment. But it rests with the engineers and managers of gas-works to decide whether, by making the principle applicable to the utilization of the abilities latent among the entire body of managers and workmen connected with their great industry, this scheme shall, to their honour, be invested with far-reaching and beneficent effects.

The question which at the outset of the inquiry naturally confronts us, resolves itself into this: Does there exist, among the managers and men connected with gas-works, latent ability which is worthy of being stimulated and utilized? Although this question might be at once answered by a simple affirmative, it may be worth while to devote to it a more lengthy reply.

It is not, perhaps, too much to say that the mechanical agents in gas making suffered immunity from the inventive spirit which marks the fourth, fifth, sixth (and perhaps the seventh) decacles of this century longer than any other department of mechanical art. The conditions under which gas making is conducted tended during these named decades to the exclusion of improvement. Every district (indeed, it might be said every hamlet) drew its supplies exclusively from the works within its own circumscribed limits; and, in consequence, the most potent spur to inventive research—namely, competition—was altogether absent. Besides, the gas manager, by reason of this local isolation, had little or no opportunity of adding to his own stock of industrial knowledge those hints of reform to be derived from associating with his fellow craftsmen, the results of which are so apparent in those industries which draw large bodies of men into daily competition and intercourse. Such conditions were obviously hostile both to a spirit of inquiry and the adoption of improvements.

I refer not only to managers, but to their workmen. The remark applied to both with equal force; for, inasmuch as no competition prevailed among the works, there was no spirit of emulation existing among the men. The conditions which obviated the former, deadened the latter; and, therefore, the instinct which exerts the most potent influence over the intensity of man's efforts, played, until quite recent times, little part in gas making.

The *status quo* was, in fact, one of stagnation. The assumption of finality in the principle of house lighting being reached, had taken root; and it can hardly be a matter of surprise that it now seems as if the heritage of practice, which had been pursued by successive generations, was found on examination to be destitute of the necessary elements applicable to the requirements of the time, and that the gas industry—managers and workmen alike—find themselves brought face to face with an entirely new order of things more or less complex, touching which they have few traditions to guide them, or experience derived from those who have gone before them, to afford enlightenment. They are brought to examine a new order of things for the first time. A powerful competitor has arisen. Their minds, therefore, are active with speculation and inquiry. Their whole forces are engaged in canvassing the adaptability of certain means to specific ends; and generally the relation of the one process to the other. They are, in point of fact, standing on the threshold of inventive research, and the entrance to a period (provided their possibilities are fully recognized) of great progress.

The present, therefore, is an appropriate time, I think, taking due cognizance of the prevailing attitude, for invigorating the awakened ability, so long, by the force of their surroundings, allowed to remain latent in the workmen, and imparting to it a strong and definite bent.

That being so, I ask the engineers and managers to consider the elements of a scheme, subject to modification, calculated to suit the situation, and promote the object for which I am contending.

1. I propose the establishment of an "Inventions Committee" in connection with the different Associations of Gas Engineers and managers, whose functions it shall be to decide upon the merits of inventions or discoveries submitted to them, and the granting of money awards where warranted. This Committee, I propose, shall consist of seven gas engineers and three

trading engineers, to be elected annually. The grounds on which a manager or workman may claim an award from the Committee might be formulated as follows:—

(*a*) That the claimant for the award has been a *bonâ fide* employee in a gas-works for at least three months immediately prior to his application.
(*b*) That he has invented a new machine.
(*c*) That he has discovered or introduced any new methods of carrying on or arranging the work.
(*d*) That he has improved any existing appliance.
(*e*) That he proposes any change in the method of book-keeping or apparatus for obtaining or formulating records capable of effecting a more correct or expeditious business check.
(*f*) Or, generally, that he proposes any change calculated to increase the utility of the machinery, or render the products superior in quality or more economical in cost.

2. In the case of a manager or workman who is unable to test the merits of his supposed invention or improvement, either through inability on his own part to make the necessary experiments, or to pay for the same, the Committee may decide to bear the whole part of the expense of doing so; and if the invention should afterwards prove a success, an award should be granted.

3. Every claim submitted to the Inventions Committee should be minuted at the first meeting after receipt of the claim; and it should then be remitted to the following meeting for consideration. In the interval, public notice should be drawn to the claim by advertisement in the JOURNAL, setting forth succinctly the subject of such claim, together with the claimant's name and address.

4. On the establishment of a claim (on the conditions above specified), the Committee should make an award, which would not fall below £5, nor exceed £200. Between these limits, the award should be fixed by the Inventions Committee, according to the opinion they may form of the value of the improvement for which the claim has been made. It is to be understood that any improvement which the Committee may not deem worthy of an award of the minimum of £5, shall be held invalid. If the Committee consider any invention put before them of superlative merit, and possessing advantages which they believe calculated to be of wide and valuable service to the gas industry, the maximum award of £200 shall be made, together with the taking out, at the Committee's expense, of patent rights in different countries, on behalf of the inventor; provided always, that all the companies and corporations who contribute to the Inventions Fund (as per Rule 11) shall have, on paying a small royalty, to be fixed, the use of any such superlative invention so protected. But the inventor shall have the right to charge an increased royalty, or patent rights, to all users of his invention in the United Kingdom who do not contribute to the Inventions Fund; and also from all users of his invention in the different foreign countries in which patent rights have been secured.

5. When a manager or workman improves a machine or appliance either in principle or in detail of construction—which improves the efficiency of that machine, or lessens the cost of manufacturing new machines of a like character—in addition to his award from the general fund, the claimant shall receive from the trading engineer whose machine is so improved, a sum additional, equal to 50 per cent. upon the amount awarded by the Inventions Committee. But any invention upon a machine which has been anticipated by the maker of such machine, in manufacturing subsequent machines, shall not be held as a valid ground upon which to grant an award, provided the trading engineer concerned notifies to the Inventions Committee his priority in the improvement.

6. The subject of any claim shall be decided upon by the Inventions Committee with reference to the particular machine or system to which it primarily relates; but the adaptation of any contrivance connected with one machine to another which enhances the utility of the latter, shall be a valid ground for an award; provided the two machines or appliances concerned are distinctly dissimilar in type, principle, or operation.

7. After the Inventions Committee have completed their consideration of a claim, the Secretary shall intimate their decision to the claimant, and advertise the result in the JOURNAL; and, if it is favourable, enclose a cheque for the amount awarded, signed by the President and Secretary. When the invention improves the efficiency of any machine or appliance (as per Rule 6), he will also enclose a requisition to pay, signed by the President and Secretary, on the manufacturer of such machine or appliance, for the amount to which the claimant is entitled under the said rule.

8. Whenever any workman or manager has received as many as five awards, he shall be paid a premium equivalent to the total amount of money paid him for these five awards. For every succeeding five awards which he may earn, he shall be paid a similar premium; but with the addition of £100 in the case of the second set of five awards; of £200, in the case of the third set of five; and so on £100 more by sets of five.

9. All claims for awards should be clearly set forth in writing and, when necessary, accompanied by a drawing or model, and to be forwarded to the Secretary under cover, marked "Inventions Committee."

10. The Secretary shall be required to attend all meetings of the Committee and keep a minute-book of the proceedings. He shall also publish in the JOURNAL the notice of the claim, and, when a decision is arrived at, give notice of same to the claimant, and, when an award is granted, publish a concise specification of the invention in the JOURNAL.

11. The funds to be collected on the following basis:—

(*a*) Works carbonizing under 2000 tons of coal per annum, to pay £10 yearly.
(*b*) Works carbonizing over 2000 tons and under 6000 tons, to pay £20 yearly.
(*c*) Works carbonizing over 6000 tons and under 10,000 tons, to pay £40 yearly.
(*d*) Works carbonizing over 10,000 tons and under 20,000 tons, to pay £65 yearly.
(*e*) Works carbonizing over 20,000 tons and under 50,000 tons, to pay £100 yearly.
(*f*) Works carbonizing over 50,000 tons and under 100,000 tons, to pay £150 yearly.
(*g*) Works carbonizing over 100,000 tons and under 300,000 tons, to pay £200 yearly.
(*h*) Works carbonizing over 300,000 tons and under 600,000 tons, to pay £300 yearly.
(*i*) Works carbonizing over 600,000 tons to pay £500 yearly.
(*j*) Trading engineers shall pay £20 per annum to the general fund.

12. It shall be within the power of the Inventions Committee to offer a prize of such amount, and at such time, as they deem advisable for the invention or discovery of any specific principle or contrivance, upon which they might judge it desirable to concentrate the inventive faculty of all those engaged in gas making; and, further, they may, in the same manner, offer a prize, under such restrictions as they may consider necessary, for the best essay on any subject relating to the trade.

I have thus put forward a scheme, which, I believe, if adopted, subject to alteration by the Inventions Committee, will stimulate the invention of ingenious contrivances, tending to facilitate general operations, extend manufacturing skill, and originate new and valuable principles in the manufacture of gas. This scheme would engender a healthy rivalry among the workmen, and cause them to exert themselves and expand their best faculties. The origin of competition is readily traceable to the institution of ownership; and the hope of being credited with, and rewarded in this public way, for inventing and improving machines, appliances, and methods, would give competition among the men that stimulus which sharpens the human intellect and develops man's inventive powers to the utmost.

This struggle for success, which constitutes competition, is only an intensified form of emulation—one of the most deep-seated feelings in man's nature. Emulation is unquestionably one of the ruling forces of life; it is one of the mainsprings to human effort. Wherever this instinct is not either deadened or obliterated, it exerts a great influence on man's efforts. It is a force that exists for good or for evil, according to the purpose for which it is used; and I ask, Why should not this powerful lever be pressed into the service of gas making with all its force? This scheme, I believe, is well fitted for such a purpose. If we enlist the spirit of emulation among the men, and press it into the service of the great gas industry, we shall have taken a step which will do much to help the gas manufacturers of the United Kingdom—managers and workmen alike—to hold their own in the face of increasing competition.

Death of Mrs. Rutter.—The death is announced of Mrs. Mary Frances Rutter, widow of the late Mr. J. O. N. Rutter, of Black Rock, Brighton, in her 91st year.

The Management of the Matlock Bath Gas-Works.—Mr. A. W. Elton, late of Newcastle-under-Lyme, has been appointed, out of 50 applicants, Manager of the Matlock Bath Gas-Works.

The Management of the Normanton Gas-Works.—Mr. J. Rann, who has been serving as Foreman under Mr. Samuel Carpenter at the Dorking Gas-Works, has been appointed Works Manager to the Normanton Gas Company.

Manchester District Institution of Gas Engineers.—The 91st quarterly meeting of this Institution will be held next Saturday, at the Rochdale Gas-Works, with the consent of the Gas Engineer of the Corporation (Mr. T. Banbury Ball), under the presidency of Mr. Charles Armitage, F.C.S., Assoc.M.Inst.C.E., of Lancaster. The programme of arrangements issued by the Honorary Secretary (Mr. S. S. Mellor, of Northwich) includes the election of four new members—Mr. G. Ernest Stevenson, of Manchester; Mr. J. L. Mitton, of Longwood; Mr. J. Walker Pitts, of Gomersal; and Mr. A. F. Goodson, of Drighlington—and the contribution of a paper by Mr. T. Stenhouse, F.I.C., F.C.S., Borough Analyst of Rochdale, on "The Behaviour of Oxygen when Air is Used in the Purification of Coal Gas." After the business, the members will, by permission of the Gas Committee, inspect the tar and sulphate works, and also the gas-works, where the Coze system of inclined retorts and Brin's oxygen plant will be shown in operation. There will be a luncheon at the Wellington Hotel; and the afternoon will be devoted to a trip to the White House, Blackstone Edge—the return being *via* Hollingworth Lake.

TECHNICAL RECORD.

ON THE VALUE OF THE BYE-PRODUCTS OF GAS-WORKS, AND ON IMPROVED METHODS OF ESTIMATING THEM.

By Chas. R. C. Tichborne, LL.D., F.I.C.,

Board of Trade Gas Examiner for the City of Dublin, Analyst to the County of Longford, &c.

[A Lecture delivered before the North of Ireland Association of Gas Managers, Aug. 9, 1892.]

When I was first asked to address this practical body of gas experts, I felt greatly complimented. But how was I to talk usefully to an assembly of men who had at any rate a much larger and more extended knowledge of gas making than I had myself? At first sight it was a puzzle; but I thought that, by taking up the subject of my present paper, I should be dealing with one upon which we could stand upon common ground, and yet one in which I could give you the outcome of special experience.

It is doubtful if the gas manager realizes the great ultimate value of the bye-products of his works, and that they are greater than the money value of the gas itself; this being specially so where coal is on the spot and gas is cheap. The reason that this is not apparent at first sight is that the gas manager, as a rule, values his bye-products as coke, gas liquor, and tar. But, to get at their real value, we must estimate them as coke pure carbonate of ammonia, benzole, carbolic acid, anthracene, creosote oil, and pitch; for these are now commercial necessities, and are procurable from gas-works alone. To obtain these ultimate products, energy must be expended and money raised. If a process were introduced for commercially making alcohol or whiskey from coal gas (not by any means an impossible thing), the carbonizer would not then calculate his make as coal gas, but as whiskey—the most valuable product. As regards the ultimate products, we have values like £30 per ton for pure carbonate of ammonia, £300 for anthracene, £75 for carbolic acid, £6 for sulphuric acid, and coal tar colours varying from 8s. to 40s. per pound. If gas managers would take the trouble to multiply the whole of their yields by these sums, I have little doubt that many of them would be surprised at the results.

These remarks ought, in my opinion, to be sufficient to show the importance of the bye-products. Why do not the gas companies pay more attention to them, and, by the manufacture of these *ne plus ultra* products, save them from falling into other hands? It becomes necessary, therefore, that the estimation of the products should be conducted accurately; and as I have something new to say upon this subject, I bring it before the present meeting. It is an important matter to you, as the money value of these products has to be determined under the supervision of the gas manager. In olden days the gas manager had no output or market for these products; and he used to be indifferent to the purification of his gas as regards such items as ammonia and sulphur. The Gas Referees were obliged to invent a carefully considered method for the estimation, in the interest of the consumer, of these causes of impurity—a method which should present a fairly quick process, and yet should be accurate. Now, all is changed, and the manufacturer of gas finds these substances of such commercial value that he displays the greatest anxiety to separate them, as far as possible, from the gas. If he is not getting his proper proportion of ammonia and sulphur, it is so much money lost; and I am sure he would thankfully receive any suggestion of a process by which he could lock up the small residue of sulphur which still remains combined with his gas. He in many cases has to sell the bye-products on the unit of sulphur or ammonia they contain; and the estimation of these substances has become a question of the highest importance to him. Processes for the estimation of ammonia and sulphur are given by the Referees; but they are now a little old, and require revision in some details.

I will first introduce to your notice a few points about the estimation for ammonia. Some years since, I read before the Royal Irish Academy a paper under the rather scientific heading of the "Dissociation of Molecules in Solution." Although a purely scientific paper, it had indirectly a technical bearing. One of the points I endeavoured to illustrate was that, on dissolving any salt in water, a partial dissociation took place between the base and the acid, though the salt might be quite neutral in the first instance. When dissolved, we have a free acid (or rather, I should say, an acid salt) with free alkali in the same solution and at the same time. This seeming paradox was known to exist in compounds in the gaseous condition; and it was found by my experiments to also exist to a more limited extent in compounds when in solution. This state of "dissociation" is specially marked when we are dealing with ammoniacal salts, or any salt where one of the radicals is gaseous. Thus, if we throw neutral sulphate of ammonia into water, a small quantity is instantly dissociated, and, instead of the salt, we have free acid and free ammonia.

A second point was also elicited by my experiments—namely, that the extent to which this decomposition is carried is regulated by, and is in ratio to, the temperature. I will illustrate this by a pretty experiment which will make plain my meaning. Here are two flasks, each containing 10 oz. of water, and in one is placed 20 grains of sulphate of ammonia—the very salt which we shall see plays an important part in the estimation of ammonia in gas liquor, or in determining the purity of the gas. It is a salt in which a strong acid is combined with the weak base, ammonia. I use for the purpose of showing the acid or alkaline condition of these salts an indicator called phenolphthalein. It is one of the beautiful coal-tar dyes. Any indicator would do; and I merely select this one because it is so plainly seen. The condition is not shown, as it is in the others, by a transition of colours, but is colourless in acid solutions, and a brilliant magenta colour in alkaline liquors. I have thus an indication by which you in the distance can detect with ease the condition of the contents of the flask. The flask containing the sulphate of ammonia has been rendered faintly alkaline with ammonia; and you will observe that the contents are bright red. To keep this fact green in your memory, I have affixed a red card to the flask. In the second flask, I have placed 20 grains of sulphite of soda, in the same quantity of water. Here again I have added phenolphthalein; but as the salt is faintly acid, we have in this flask a colourless solution, and I again mark the fact by attaching a white card. We will now place the two flasks over Bunsen burners, and you will see this curious phenomena take place. As they get hot, the white solution gradually becomes pink, and ultimately magenta, while the red solution grows paler and paler until it becomes water white. In fact, the acidity and alkalinity of these two solutions have become reversed by the action of heat, which is evidenced by their change of colour. The dual phenomenon is due merely to the rise in temperature in each case disengaging the acids and alkalies. They are, in fact, both really free, but as sulphuric acid is a very strong one, it affects the indicator first; and in the case of sulphurous acid, it being so weak, the base wins the battle, and the reverse phenomenon is produced. That this dissociation is only temporary, can be easily shown; because, on placing the vessels half submerged in ice water, you will see the lower stratum of fluid in both flasks regains its old colour.

Now, it is self-evident that the temperature will have an immensity to say to the estimation of ammonia by a volumetric solution of sulphuric acid. Both the process of the Referees and the gas manager's practical method for gas liquor consist in estimating in this manner, and in using an indicator to show when we have employed a sufficient quantity of the volumetric solutions to produce a neutral compound. But I have shown that this point varies with the temperature, and that, if we are to get correct results *the volumetric solutions must be made and titrated at a standard temperature (say, 62° Fahr.*), and all estimations must be performed at that temperature.* Directions for temperature, &c., are not touched upon either in the Gas Referees' or the gas liquor process. The use of volumetric solutions of ammonia should also be discarded for volumetric solutions of soda. The soda produces much sharper and more reliable results, as it introduces less of the unstable ammonium compounds.

I subjoin details of an actual experiment as an illustration of these remarks. The lower of the temperatures taken illustrates what would be found in the laboratory in winter—viz., 50° Fahr., while 70° Fahr. is a common temperature in gas-testing stations during the summer. Solutions at 62° Fahr. of ammonia and sulphuric acid were made, having such a strength that, at 62° Fahr., 50 c.c. of the volumetric solution of ammonia exactly neutralized 10 c.c. of the sulphuric acid; 50 c.c. of the ammonia solution were then exactly neutralized at 50° Fahr., when it was found that 10·2 c.c. of sulphuric acid were required at this temperature. The solution was then warmed to 70° Fahr., when it was found that 0·3 c.c. more of ammoniacal solution were required to neutralize. So that we find the difference is as follows:—

At 50° Fahr.	10·2 c.c.	=	NH_3 0·1734 gramme.
At 70° Fahr.	9·9 „	=	„ 0·1683 „
	0·3 c.c.	=	NH_3 0·0051 gramme.

As the experiment was performed on 50 c.c., it is a difference of 0·01 of ammonia on 0·34, or 3 per cent. (2·9).

We see from the above experiment that, if the volumetric solutions have been made at the normal temperature, an approximation to accuracy would be obtained by adding or subtracting, as the case may require, 1·5 per cent. for every 10° Fahr. observed at the time of the experiment.

I will now pass on to the subject of sulphur—another of the most valuable bye-products of gas-works. I need not describe here the process of the Gas Referees for the estimation of that substance, and their well-known arrangement for the condensation of the products of combustion. This simple yet elegant process consists essentially in burning a small flame of the gas slowly in an apparatus arranged for the condensation of the products of combustion. The gas is burnt in an atmosphere of ammonia; and the sulphur is supposed to be fully oxidized and carried with the other products of combustion into the condensed liquor. But the oxidation is not perfectly done, however carefully the process is carried out. It was proposed by the late Mr. T. W. Keates in the first instance, and afterwards

* Most volumetric measures, &c., are graduated at 60° Fahr.; but (though the error is slight) this graduation is wrong, because the imperial gallon, upon which the gas manager bases his calculation, is standardized at 62° Fahr.

endorsed by Professor Wanklyn, that iodine should be introduced into the apparatus in place of carbonate of ammonia. This will, no doubt, effect the conversion of the lower oxides of sulphur, so that they will all be precipitated as sulphate of barium. But there are in my mind sundry objections to the iodine which are well worthy of consideration, if a better process can be devised. In the first place, iodine is very costly—a consideration in a process which is always going on; secondly, manipulation with iodine stains the hands, while the fumes are unhealthy, and corrode all the brasswork of the instruments in the laboratory. Bromine has been tried by myself with marked success; but all the objections which apply to iodine apply with even greater force to that element.

The substance which I have ultimately found to answer all purposes is peroxide of hydrogen of the strength of 10 volumes. In practice, the use of this compound is simplicity itself, and attended with no more inconvenience than the use of water. In the Referees process, some of the sulphur escapes oxidation into sulphuric acid; and as the lower oxygen acids of sulphur do not produce compounds with barium which are insoluble, they are washed away. I will illustrate this by a simple experiment. I have here the products of combustion of 10 cubic feet of gas, procured by carrying out an experiment strictly according to the Referees process. It has been precipitated by barium chloride solution, and filtered from the sulphate of barium, which should really represent the whole of the sulphur present. I will now add another ounce of the barium chloride solution, first to demonstrate to you that all the sulphate has been precipitated; and, secondly, to have present an excess of barium. I now add an ounce of the peroxide of hydrogen; and you will see that in a few seconds the liquor becomes milky from further sulphur compounds which the Referees' process had failed to catch. The reaction may be represented by the following equation:—

SO_2	+	H_2O_2	=	SO_3	+	H_2O
Sulphurous Anhydride.		Peroxide of Hydrogen.		Sulphuric Anhydride.		Water.

As commercial peroxide of hydrogen sometimes contains traces of sulphuric acid, it is desirable that a little solution of chloride of barium be added to the stock-bottle, and the supernatant peroxide decanted for use. In practice, it is only necessary to add the ounce of peroxide immediately preceding the boiling in the Referees' process.

The following table will illustrate the difference in the results obtained in actual practice:—

Grains of Sulphur per 100 *Cubic Feet of Gas.*

	Referees' Process.	Bromine Process.	Peroxide of Hydrogen Process.
Experiment 1	10·11	18·24	18·14
„ 2	13·15	20·18	19·98
„ 4	13·42	21·00	20·92
„ 6	17·24	25·18	25·20

If time would permit, I might enlarge upon the question of how the yield of these bye-products could be increased; but this subject would land me far beyond the limits of one discourse. There are some which are allowed to escape altogether, and which actually entail considerable expense in removing. Thus, every ton of coal gives 10 per cent. of carbonic acid gas, which, when liquefied, constitutes a commercial article worth about 2d. per pound. As you are now no doubt aware, by a patent originated by me, this same gas was some time ago a waste product in the breweries, but is now extensively reclaimed at Messrs. Guinness's and other establishments. Why should not the gas manufacturer utilize to advantage his 10 per cent. of carbonic acid gas?

In conclusion, let me remark that when the time shall come, that the tidal wave or the falling river shall grind electricity out of the bowels of the earth free of cost, coal will still have to be carbonized for these valuable bye-products, which, in my opinion, are not estimated at their proper value, either in the gas manager's mind or in actual practice.

Sir Matthew White Ridley, Bart., M.P., who was Chairman of the Select Committee on the Metropolitan Water Supply last year, has been admitted a member of the Privy Council.

The New Franchise of the Providence (R.I.) Gas Company.—In the JOURNAL for the 2nd inst., we gave some particulars, supplied by an American correspondent, as to the new contract arranged between the City Council of Providence, Rhode Island, and the Gas Company. It may be remembered that, in the course of his opening paragraph, our correspondent stated that, by the conclusion of this contract, the "gas war" in Providence had practically reached its final stage, though it could scarcely be said to have actually concluded. It seems that, although the Council approved of it, the Mayor had put his veto upon the transaction; and consequently there was a hitch. However, the Board of Aldermen, at their meeting on the 4th inst., expressed their concurrence with the Council, and passed a resolution authorizing the Mayor to execute the contract. There were only two dissentients; while there were seven supporters of the resolution. There is every probability therefore, that peace will henceforth reign in Providence; and that prosperity will attend the Company's operations, who, under the new contract, are assured of an 8 per cent. dividend.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

In the JOURNAL last week, we gave the text of the two papers read at the recent annual meeting of the above Association in Edinburgh which bore most closely upon subjects with which our readers are specially concerned. We now notice briefly some of the communications on matters of more general interest.

ELECTRICAL STANDARDS.

In the Mathematical and Physical Science Section, Mr. R. T. Glazebrook, of Trinity College, Cambridge, presented a report on behalf of the Electrical Standards Committee of the Association. He stated that the most important coils which had been tested during the year were a series prepared for the Board of Trade, one of which was to be chosen as a partial standard of resistance. During the session of the Association, a meeting had been held with a number of distinguished foreigners, to consider the question of identical standards in various countries. Major Cardew, of the Board of Trade, was present, and took part in the discussion. Dr. Helmholtz was also present, and called attention to the necessity for having a unit of resistance. The following resolutions were adopted: (1) That the resistance of a specified column of mercury be adopted as the practical unit of resistance. (2) That 14·4521 grammes of mercury in the form of a column of uniform cross section, 106·3 c.m. in length at 0° C., be the specified column. (3) That standards in mercury or solid metal, having the same resistance as this column, be made and deposited as standards of resistance for industrial purposes. (4) That such standards be periodically compared with each other, and also that their values be re-determined at intervals, in terms of a freshly set-up mercury column. It was further agreed that these resolutions should be communicated to the Electrical Standards Committee of the Board of Trade. With regard to the unit of current of electro-motive force, it was agreed that 0·001118 should be adopted as the number of grammes of silver deposited per second from a neutral solution of nitrate of silver by a current of one ampère; another value (1·434) as the electro-motive force in volts of a chalk cell at 51° C. Speaking on the report, Professor Helmholtz supported the proposal to have identical standards, for which, he said, electricians in all parts of Europe had been working. He also advocated the column of mercury as being preferable to the alloys which had been experimented with in this country, as small fissures in the alloys might interfere with the results. They found that the English and German tests were sufficiently near to each other to serve for commercial purposes, perhaps for centuries; but for scientific purposes some alteration might perhaps be necessary. He and others had been sent over here by their Governments to try to come to an arrangement with Great Britain; and they hoped America and France would come into the same agreement.

The report was adopted; and Mr. Glazebrook was thanked for his labours.

PRIMARY AND SECONDARY CELLS IN WHICH THE ELECTROLYTE IS A GAS.

In the same Section, the President (Professor A. Schuster, of Manchester) read a paper on primary and secondary cells in which the electrolyte is a gas. Starting from the fact that, when an electric discharge is passing through a tube, the whole tube becomes a conductor, he explained that he had studied the laws of that conduction, which he called the "secondary conduction," in gas. On the theory of different physicists, that the primary phenomena of discharge depend on the association of molecules, it must often, he said, have struck those who worked at it that they had never found any effects of polarization such as they had when water was being decomposed into gases. In his experiments, he had not found any trace of polarization in the secondary conductor when an elementary gas was the medium used. When compound gases were used, there was only a very small trace of polarization; but since he had introduced hydrocarbon gases, he had had very marked phenomena of it. The manner in which the polarization fell off in these gases was the way in which it fell off when water was the electrolyte. When a steady current was passed through the gas, there was a return current as in water. This pointed to some work done by the current in the nature of electrolysis. When different electrodes were introduced, widely different results were obtained. With copper and iron, very small effects of polarization were obtained; but where magnesium and aluminium were used as the electrodes, these effects were increased to an enormous extent. With magnesium electrodes, if a current were passed for a long time, they recovered an electromotive force of 35 volts from a single cell. This showed that it was not an ordinary effect of the decomposition of the gas, but was much more similar to that of secondary cells. Cases in which gas, under the influence of a primary discharge, was able to act as an electrolyte in so far as primary cells were concerned had been described by Professor Reinold. He had himself made many experiments, and tried a number of gases; and here also he had found that aluminium was one of the most active metals, and gave remarkably uniform results.

In the discussion which followed, Professor Helmholtz joined. Dealing principally with the luminous effects obtained by vacuum tubes, he said he considered that all chemical combinations—

at least those which could be separated again by electric currents —were composed of at least two atoms, one of which was charged negatively and the other positively. In the vacuum tubes there was always a measurable quantity of air adhering to the interior of the glass—especially if the tubes had been filled a long time with air; and there was always the possibility that the positive atom was drawn away by a positive charge near the surface of the glass, and the negative atom attracted. The Professor went on to speak of the liability of glass tubes from which the air had been partially exhausted to electrification by contact; and he illustrated this by pointing out how an electric light is produced by the rolling of a drop of mercury in a partially exhausted tube.

Spectroscopic Measurements.

Another paper which came before the Section was on "The Application of Interference Methods to Spectroscopic Measurements." It was by Mr. A. Michelson, who has been appointed to a professorship in the new University of Chicago; and it was acknowledged by Professor Schuster and others to embody the most advanced experiments in spectroscopy which have yet been attempted. The writer first explained that the ordinary methods of producing dispersion—such as by the prism or grating—sufficed to separate lines when their distance apart was 1-50th of the distance between the two sodium lines. In order to get more precise results, it would be necessary to multiply the size of the grating according to the degree of precision required. For the purposes of his investigation, he had devised an apparatus which he called a "wave compiler," which enabled him to produce interference of the rays which were being examined; and, by altering the distance of the paths of the rays, to vary the clearness of the interference fringes. If the light under examination were made up of two distinct sources, as in the case of sodium, a regular and periodic variation was obtained. If such a periodic variation were seen in the clearness of the fringes, they might argue with certainty that the light was a double one. Extending the investigation still furthur, he showed that, if the curve was of any form, no matter how complex, then, by mathematical relation, one could deduce the form or distribution of the light, whether it was double, as in the case of sodium, or triple or quadruple, as in that of other substances. He said he had experimented upon various substances—hydrogen, oxygen, sodium, zinc, cadmium, talmium, and mercury; and in almost all cases he had found that the lines which appeared in the most powerful spectroscope to be single were doublets or triplets; and in some cases very much more complex. In the case of hydrogen, especially, they could alter the temperature and pressure with facility; and on examining the visibility curve of hydrogen, he had found that the distribution of light in the source, deduced from these curves, was such as to indicate that the width of the component lines diminished as the pressure was reduced, though not indefinitely, but approached a certain limit. This seemed to indicate that this limit, according to the kinetic theory, depended on the temperature of the gas. A much stronger confirmation of the truth of the theory was furnished by the application of Doppler's theory, of the vibration of the radiating molecules of the substances examined. It had been argued that the fact of being able to get interference with such a wide difference of path (this difference had been increased from some 50,000 up to about 800,000 or 900,000 waves) was that the effect of the motion of the molecule in the line of sight must be negligible, and that therefore the kinetic theory of gases, which was based upon that theory, must be wrong. A comparison of radiations from upwards of twenty different substances gave numbers which in every case were of the order of magnitude required by the kinetic theory. This, the author said, might perhaps be considered as the most direct proof in existence of the motion of the gaseous molecule.

During an adjournment of the proceedings, an opportunity was afforded for inspecting the "wave compiler." It consists essentially of a plane parallel glass and two mirrors. Light from the radiating substance impinges on the plane parallel glass at an angle of 45°, and is partly reflected and partly transmitted; the two pencils striking the two mirrors at normal incidence, and being reflected back each on its own path, falling again on the plane parallel plate, and there re-uniting to form a beam of light which can be observed by the eye or the telescope. One of the mirrors is moved in such a way as to be kept parallel with itself by means of a slow-motion screw; thus producing a difference of path, which causes a change in the clearness of the interference fringes from which the distribution of light before described is obtained.

The Detection of Inflammable Gases in Air.

In the Chemical Science Section, Professor F. Clowes, of Nottingham, read a paper on the application of a hydrogen flame in the safety-lamp to the detection and estimation of inflammable gases and vapours in air. He said that the appearance of a "cap" over the flame in the safety-lamp had long been used by coal miners for detecting fire-damp in the air, and for roughly measuring its quantity. The ordinary oil-flame did not with certainty detect the presence of less than 3 per cent. of fire-damp. The flame of alcohol adopted by Pieler readily detected 0·25 per cent.; but since this flame did not give any light, the Pieler lamp could be used for gas-testing only, and was useless for lighting purposes. At the previous meeting of the Association, the results of an examination of the Ashworth lamp were given by the author. This lamp burned benzolene, and was found to give good illumination when the wick was raised, and to detect at least 0·5 per cent. of fire-damp when the wick was pulled down until it gave a pale-blue flame only. In the present paper, the author described a miner's safety-lamp, in which the ordinary flame could at once be replaced by a hydrogen flame when desired. The use of this flame enabled the miner to detect readily, and with certainty, percentages of fire-damp varying between 0·25 and 3 per cent., and to measure their quantity. As soon as the delicate testing was finished, the ordinary flame of the lamp was kindled, and could be employed either for illumination, or, if lowered, applied to the detection of percentages of gas larger in amount than those found by the hydrogen flame. The hydrogen gas was carried in a small steel reservoir, slung over the shoulder by a strap, and was introduced through a fine metal tube which passed into the interior of the safety-lamp, and terminated near the wick. This composite lamp was at once a good illuminator and an extremely delicate gas tester. Comparative experiments were made with a hydrogen flame, an alcohol flame of the same height, and a small blue benzolene flame, all of which were exposed in air containing 1 per cent. of coal gas. The "cap" seen over the hydrogen flame was nearly four times as high as that seen over the benzolene flame, and half as high again as that seen over the alcohol flame. Many serious accidents had occurred from bringing a naked flame into spaces in which light petroleum oil had been stored. The vapour of this oil, when mingled with the air in proper proportions, was violently explosive; and it became important, therefore, to have means of detecting its presence and measuring its amount. The author described tests carried out with the hydrogen safety-lamp in his testing-room. They proved that the hydrogen flame could detect 1-20th of the amount of petroleum vapour which could be kindled in air, and 1-36th of that which exploded when mingled with air.

Some discussion followed, in the course of which several members expressed their sense of the high value of the lamp. In his reply, Professor Clowes said that in dusty mines a very small percentage of gas was dangerous, and a percentage which a bright-flame lamp would not indicate. Colliery managers, he found, did not wish to have a lamp that would indicate small percentages of gas; for it would cause them a great deal of extra trouble. They would prefer one which would give no indication of gas at all; and as they could not get that, they preferred to stand by the ordinary lamp, which did not show a less quantity of gas than 3 per cent.

The Impurities of Town Air.

Another paper in the same Section was on the above subject; the author being Dr. G. A. Bailey. He said that during the past twelve months the Air Analysis Committee of Manchester, in conjunction with the Royal Horticultural Society, had been engaged on the analysis of the air of large towns. A large amount of information having been already collected by previous observers as to the carbonic acid in the air, it was thought desirable to devote more special attention to such impurities as sulphurous acid and organic matter. Furthermore, since the object in view was not merely to collect data, but to lay the foundations of what might be termed chemical meteorology, the atmospheric conditions prevailing at the time of the observation had been noted. From the results of several hundreds of analyses carefully conducted in London, Manchester, and Liverpool, the following conclusions had been drawn: (1) That in clear breezy weather the amount of sulphurous acid is less than 1 milligramme per 100 cubic feet of air. (2) That in anti-cyclonic periods it rises very considerably; and in times of fog, maxima of 34 and 50 milligrammes have been recorded for the worst districts of Manchester and London respectively. (3) That wherever an open space or a less densely populated area occurs, there is a very marked diminution in the amount of impurities in the air. (4) That an increase in the quantity of sulphurous acid is accompanied by at least as large an increase in the organic impurities in the air. (5) That smoke, promoting as it does the formation of fog, and preventing free diffusion into the upper stratum of the air, must be regarded as the principal cause of the impure state of the atmosphere in all large towns.

In the discussion upon the paper, Sir Douglas Galton said the subject dealt with therein was one which had not been sufficiently treated on former occasions; and he hoped that the Committee would pursue their inquiries further, and afford some additional information. He did not suppose they would be able with great ease to purify the air of large towns, so long as they consumed their coal in open fireplaces, and continued to allow factory chimneys to send their products of combustion into the air without being purified. There were many methods by which the air in the midst of towns was rendered impure; and the more they could show in what respect each source contributed towards the total impurity, the more they would be able to impress upon the people the great importance of removing these sources. Mr. A. E. Fletcher, the Chief Inspector under the Alkali Act, said that, as long as they had open fireplaces, they would have smoky chimneys. They might prevent smoke from rising from factory chimneys; but it was very hard to see how they would be able to attack the multitude of small household

fires which contaminated the atmosphere. There was one thing they might do. Let them try to filter the air through cotton wool. He had erected a filter of this kind in his own house, with great success. Dr. Bailey, in reply, said the practice was becoming much more prevalent of using the atmosphere for carrying off the pollution of sewers. It was quite possible that modern sanitary improvements might have the disadvantage of throwing a larger proportion of organic matter into the air than formerly; and as diffusion went on very slowly during the prevalence of fogs, it accumulated in the air. He did not suggest that the results he had stated were anything else than approximate; but they were in advance of all that had been formerly obtained in this direction.

Other papers will be dealt with in subsequent issues.

SOCIETY OF CHEMICAL INDUSTRY.

Inaugural Address of Professor Emerson Reynolds.

(*Concluded from p.* 300.)

I turn now from coal to peat, which is, as you know, a much less mineralized solid fuel. It is obvious that the question of peat utilization is one of much importance in Ireland, as nearly one-seventh of the island is bog. About 1,250,000 acres are mountain bog, and 1,575,000 acres are occupied by flat bogs, which occur over the central limestone plain of the country and stretch away to the north-west. This store of peat is an asset which may become valuable when you shall have exhausted your coal beds some 170 years hence. We would naturally desire to realize a portion of our assets at a much earlier date, as nearly all the coal used in Ireland must be brought from the eastern side of St. George's Channel. In this fact, I think you have some explanation of the depressed industrial condition of the country, as manufactures involving the use of much fuel can only flourish in Ireland if the margin of profit be considerable. Where the margin is small, and competition keen (as in the greater industries), they must go under in the struggle with manufacturers having cheaper fuel at command. I grant at once that this is no adequate explanation of the absence of many chemical manufactures which do not involve a large consumption of fuel; but it is the inevitable result in the cases to which my remarks apply.

Peat alone, however well prepared, compares very unfavourably with coal in several particulars: 1. It is a very bulky fuel, in its ordinary condition; occupying rather more than five times the space of an equal weight of coal. 2. It contains from 15 to 25 per cent. of water, and seldom less than 10 per cent. of ash. 3. At least 2½ tons of average peat are required to perform the same work as 1 ton of average Staffordshire coal in ordinary fireplaces or furnaces. Hence the general use of ordinary peat is attended by the disadvantages of requiring much greater storeage room than coal, of producing a light and troublesome ash, and requiring more than thirteen times the bulk of coal to produce the same thermal effect. The last-mentioned consideration practically precludes its use in ordinary furnaces, where heat of high intensity is required. Now the force of the first objection to the use of peat—that of bulk—can be materially diminished by mechanical compression. Many excellent examples of compressed peat have been produced at various times; the most coal-like product I have seen being that of Mr. Hodgson, of Derrylea, who compressed thoroughly disintegrated and dried peat in heated cylinders, and by partially carbonizing under pressure, secured the cementation of the material. Moreover, the ash of such compressed peat was not so bulky as that of the ordinary fuel.

I need scarcely say that the intensity of the heat obtainable with compressed peat is greater than with the loose material; but the actual thermal effect is not much altered, save in so far as the material is drier, and therefore less heat is lost in evaporating moisture.

Extended comparative trials of coal and of good dense peat in steam-engines has shown that the work done by a ton of peat was not more than 45 per cent. that of a ton of coal. Hence if coal were 18s. per ton, peat could not compete with it under the most favourable conditions unless delivered at not more than 8s. per ton. Now the peat used in these trials did not contain more than 12 per cent. of moisture; but, as dug from the bog, it seldom contains less than 35 per cent. of water, even when cut from a comparatively dry bog. It must then be stacked and air-dried. The present price of ordinary turf delivered at the bog is about 7s. per ton; and when to this is added the cost of handling this bulky fuel, and carriage for 50 miles, the cost exceeds 45 per cent. of that of coal even at inland towns. Hence there is no real economy in the use of peat of the common kind in ordinary furnaces and grates instead of imported coal.

But the public are led by promoters of peat manufacturing companies, and others who should know better, to suppose that by certain processes of disintegration and compression, peat can be made to approach very closely in fuel value to an equal weight of coal. There is no doubt that a better-looking and denser product can be obtained by these means, and one which requires less storeage room; but, unless artificially dried as well, the actual heating effect of the fuel is not materially altered. I have no doubt that the cost of winning and treating the rough peat could be much reduced by the use of suitable labour-saving machinery; but all methods with which I am acquainted, involving artificial drying as well as mechanical compression, have cost so much that the product could not compete with coal at the ordinary level of prices. As I have already said, the Irish peat forms a valuable asset, but one not capable of being realized on any considerable scale at present—at least when used as fuel in the ordinary way as a substitute for coal. But it is possible to so burn peat that it shall compare much more favourably with coal; and this solution of the problem is obtained by converting rough peat into gas.

You doubtless remember that in 1872 the cost of coal advanced even beyond the panic prices which prevailed for a week or two about the beginning of the present year. But the coal famine of 1872 lasted for a considerable time; and serious efforts were then made in Ireland for the utilization of peat. It soon became evident that the continuance of dear coal meant the suspension of several industries, and their probable loss to the country. Hence, leaving to others the attempts to convert peat into a suitable fuel for general domestic use, I took up the industrial side of the problem.

I saw that the best chance for economically applying peat for most manufacturing purposes, lay in gasifying the material in a Siemens furnace, as two special and important advantages must obviously be gained thereby: 1. The use of peat in the rough state without artificial drying. 2. The avoidance of the injurious effects of abundant ash by burning the peat gas at some distance from its source, and under such conditions that the comparative value of coal and peat should be nearly in the proportion of their percentages of carbon. I therefore moved the Royal Dublin Society to appoint a Committee of engineers and other scientific men to have the value of peat tested in the way proposed. The outcome was that the Directors of the Great Southern and Western Railway of Ireland, acting on the recommendation of their able Locomotive Engineer, Mr. Alexander Macdonnell, C.E., decided to erect a complete Siemens regenerative gas-furnace for working up scrap iron in their engine-factory at Inchicore. This furnace was supplied only with rough peat, often containing as much as 38 to 40 per cent. of water; but no difficulty was found in keeping the welding chamber at a bright white heat for months at a stretch. The average consumption of fuel was 5·09 tons of peat for each ton of iron forged from scrap to finished work. Before the Siemens furnace was built, the ordinary air-furnace, fed with coal, was employed; and the average consumption per ton of iron was 4·96 tons of coal. I need scarcely say that peat is practically useless in such a furnace. Therefore peat used in the gas-furnace, as compared with coal in the ordinary welding furnace, not only proved in practice to answer extremely well, but performed 97 per cent. of the work done by an equal weight of coal. As the price of peat was about half that of coal at the time, Mr. Macdonnell estimated that a saving of £4 7s. 9d. per ton of finished forgings was effected. If, therefore, the coal-beds were exhausted, we have a good substitute in peat for operations in which a very high temperature is required, provided the fuel is used in the gas-furnace, or according to some similar plan.*

The above remarks refer to work done 20 years ago. Now, thanks to the valuable investigations of Mr. Ludwig Mond, F.R.S., detailed in his Presidential Address of 1889, the production of ammonia from peat along with gas, according to his method, will probably pay for gasifying the fuel, and materially facilitate the utilization of peat.

Much to my surprise and regret, this work remains the sole practical outcome of our efforts in the direction of peat utilization during the fuel famine of 1872, so far as Ireland is concerned. Manufacturers now know how they can economically use peat for high temperature operations; and Dr. Bindon Stoney, F.R.S., has suggested that peat should be gasified at the bogs, and carried to convenient centres of industrial activity. This could undoubtedly be done, especially if instead of "producer" gas, a fuel were manufactured approaching water gas in composition; and such a gas of good calorific power can be manufactured from peat. Thus, as in the case of coal, peat could be made economically to provide light and heat energy as well for domestic use as for manufacturing purposes. Would that we could apply even a small portion of the energy stored up in peat to stimulate those who should be most active in utilizing, in the best and most economical way, the abundant material almost at their doors!

If, then, there are many and great advantages in converting our bulky solid fuels into gas, and distributing them in that form for heating purposes or supplying power by means of gas-engines, it is clear that such advantages must be confined for the most part to towns or special manufacturing centres, unless the gases are condensed to the liquid form, and so rendered portable to considerable distances. But nature has already done a great part of this work for us in providing the wonderful material we call petroleum.

I do not think "wonderful" is too strong an adjective to apply to this material, whether we consider its nature, speculate

* Of course, the comparison is more favourable to coal when the latter is used in the Siemens furnace, as it is found that a ton of iron required an average of 3 tons of coal. Therefore the work done by peat was about 60 per cent. of that by coal under the same conditions.

as to its probable origin, or attempt to measure its value in the world's work; and in this, the concluding section of my address, I propose to sketch in broad outline the main points of public interest which relate to this, the most important of our liquid fuels. Fortunately, our *Journal* is rich in the technical literature relating to petroleum, and has been the means of communicating some admirable original papers on the subject—notably those of Mr. Boverton Redwood on the Russian and Galician centres of the oil industry, and Dr. Armstrong on the Pintsch and Keith's systems of converting rock oil into permanent gas.

As you well know, the general term petroleum—"oil of stone," or "rock oil"—is applied to the fluid mixtures of hydrocarbides containing approximately 85 per cent. of carbon and 15 per cent. of hydrogen, which are found at many points on the earth's surface, either saturating the soil or rising in springs of inflammable liquids. The existence of these combustible natural oils or naphthas was known before the present era, probably many centuries before Christ, and various ancient historians mention their use for illuminating purposes. Down the centuries we find traces of the use of these naturally occurring oils, especially in South-Eastern Europe; and from very early times the naphtha of Baku, in Southern Russia, was used for illuminating purposes and as fuel. More or less spasmodic efforts in the direction of utilization were made; nevertheless the great petroleum industry was virtually non-existent 50 years ago.

In examining the history of any industry, it is interesting to seek for the primary impulse which set the necessary forces in motion; and I think, in the case in question, that impulse was given not quite 50 years ago by a keen observer and distinguished Chemist, who is, I am happy to say, still with us. In 1847 Sir Lyon (then Dr.) Playfair recognized the nature of a dark oil met with in a Derbyshire coal mine; and at his instance the late Mr. James Young produced from this material illuminating oils, as well as solid paraffins. Although this particular source of illuminating oils was soon exhausted, and Mr. Young had to turn to other materials from which to distil paraffin, the value of these as illuminants had become generally known, and stimulated the search for natural springs.

No fresh ones of importance were discovered in these islands; but in 1858 Colonel Drake made his celebrated discovery of petroleum in abundance at Titusville, Pennsylvania, U.S.A., and laid the foundation of the great American petroleum industry, which developed with surprising rapidity as new sources were recognized in other States.

The President next quoted statistics to show the rate of growth of the petroleum industry. Dealing first with the United States, he pointed out that the official reports gave the total production of crude petroleum in 1859 as 2000 barrels of 42 gallons; while in 1889 it was nearly 35 million barrels; and in 1890 it had risen to nearly 45 million barrels. Turning to Russia, which, next to America, is the principal producer, other statistics adduced showed that in 1889 the production was about 21 million barrels; in 1890, it was 25 millions; whilst last year it was estimated at 30 millions. Taking in the other places, the world's production of crude petroleum might, he said, be estimated at fully 75 million barrels, or upwards of 10 million tons, per annum. The remarkable growth of the oil industry in little more than 33 years naturally suggested the question whether or not the supply would continue; but, unfortunately, no such means of forming even an approximate judgment existed in the case of rock oil as in that of coal. He believed, however, it was a fact that the large oil-producing districts did not, taken as a whole, afford material indications of diminished productiveness, notwithstanding the enormous drain upon them. Particular wells became exhausted; but new ones were bored, and the output was maintained. This, however, was a process which must have its limits. Professor Reynolds then passed on to deal with the origin of petroleum, and gave the substance of the views of geologists on this subject, as embodied in the Eighth Report of the United States Geological Survey. These views, he said, go to show that the supply of petroleum is not inexhaustible; but geologists do not even guess at its duration. In contrast with all this is Professor Mendelief's opinion that petroleum is not a product from organic material, but is chiefly formed from the action of water at high temperature on carbide of iron, which he supposes to exist in abundance within or below the earth's crust. The question whether or not this view can be sustained must be left for further evidence to decide.

After the foregoing digression, the President continued: The porous strata saturated with petroleum often lie at considerable depths below the surface oil of the district; and the oil is in many cases prevented from rising by a bed or shell of almost impervious material. In boring for the oil, this enclosing shell is penetrated; and the result often is the ejection of a column of liquid rising as a fountain of several hundred feet into the air. This violent expulsion of petroleum is due in great part to the pressure of pent-up gases; and the crude liquid always contains some of these gases in solution. In some instances, gas only issues, and a so-called "gas well" is obtained, from which are emitted enormous volumes of marsh gas and its lower homologues, as well as hydrogen. Some of these American gas wells afford from 10 to 14 million cubic feet per day, delivered at a pressure of as much as 400 lbs. to the inch. Such gas is a fuel of high value; and, as you know, it has been largely utilized for industrial and domestic purposes at such great industrial centres as Pittsburgh.

One million cubic feet of the natural gas obtained from the Trenton limestone at Findlay, Ohio, are said to do the same amount of work in heating as about 60 tons of Pittsburgh coal. Some of these gas wells have been exhausted; but others have continued in full productiveness for several years. Although this natural gas is compressed and transported in cylinders to considerable distances, it evidently must remain of almost exclusively local value. Not so the liquid petroleum which issues along with it, or in its immediate neighbourhood. This is the most portable of all fuels obtainable in Nature; and therefore is the most convenient means by which light and heat can be transmitted to all parts of the world. Hence it is of greater practical interest to us than the natural gas.

You are aware that the hydrocarbides of which the American petroleum consists, chiefly belong to the saturated group C_nH_{2n+2}, whereas those of Russian petroleum are mainly benzenoid hydrocarbides of the general formula C_nH_{2n}, isomeric with the olefines, but really hydrogenized aromatic compounds of the naphthene series. Petroleum from both sources affords some of the lower homologues of marsh gas. Hence in the process of refining crude petroleum by distillation, the first products consist largely of butane, pentane, and hexane, which are separated and condensed by pressure; the product being used for refrigerating purposes owing to its high volatility. Between 80° and 120°, American petroleum affords a spirit of specific gravity about ·75°; and above 130° the illuminating oils are obtained whose gravities vary about ·8, while the residue which is not vaporized at 300° includes the heavier lubricating oils, which are also admirably suited for use as fuel, and are cheaper than those generally used for lighting purposes. During this process of refining by simple distillation, there is always more or less decomposition in progress. Hydrocarbides of high molecular weight are resolved into simpler ones at a comparatively high temperature; and when crude petroleum or its constituents are rapidly heated, this resolution can be carried so far as to convert a large proportion of the oil into permanent gas, valuable alike for illuminating and heating purposes. Thus petroleum is a fuel which can be permanently gasified with facility, and is no doubt wholly converted into gas just prior to combustion in our common lamps.

Several methods are employed for the conversion of oil into rich gas, and storing the latter for distribution through tubes in the ordinary way. In one class of such processes, the oil alone is rapidly heated to a temperature of from 800° to 1000° in iron retorts, as in the methods of Pintsch and Keith, thoroughly described by Dr. Armstrong in Vol. III. of our *Journal*.* The yield of gas seldom exceeds 130 cubic feet per gallon, as liquid hydrocarbides of low boiling points are condensed chiefly during the compression of the gas into cylinders for use in railway carriages. The gas is rich in carbon compounds, including methane, ethylene, and crotonylene; and its illuminating power, even after compression, is seldom less than 45 candles. I may add that Mr. Ivison Macadam has given in Vol. VI. of our *Journal*,† a valuable series of observations on the gas-producing power of various oils treated by a process very similar in plan to that of Pintsch.

Another mode of converting petroleum into gas includes the use of steam, as in the process of Messrs. Rogers, of Watford, who inject the oil into red-hot retorts by means of steam; the latter appearing to facilitate the permanent change of the petroleum without the formation of much carbon monoxide. The gas so produced is said to amount to about 140 feet per gallon of heavy oil used, and has, according to Mr. Rowan (Society's *Journal*, Vol. VII.‡), the following composition:—

Hydrogen	31·61 per cent.
Marsh gas	46·17 „
Illuminants	16·29 „
Carbonic oxide	0·14 „
Nitrogen	5·06 „
Oxygen	0·73 „

This gas is stated to have an illuminating power of fully 56 candles, and to lose little either by standing or by carriage to considerable distances. As such petroleum gas has about 3·5 times the illuminating power of 16-candle coal gas, it follows that, so far as illuminating purposes are concerned, the gas producible from one gallon of oil by this process is equal to some 525 cubic feet of coal gas of 16-candle value. I shall later on refer to the heating value of this petroleum gas; but I have now justified the statement with which this section commenced—viz., that petroleum is virtually liquefied gas in a peculiarly portable condition. Hence in all states petroleum can be used as an illuminant as well as a fuel; whereas coal and peat can only be used as illuminants in so far as they can afford carburetted gas.

Let me now proceed to justify the further statement that petroleum is the most concentrated, and on the whole the most portable, of all the natural fuels met with in considerable quantities.

Weight for weight the efficiency of liquid petroleum in steam-raising is much greater than that of coal. The estimates of relative value necessarily vary with different portions of the crude materials used, and with the quality of coal employed in

* See JOURNAL, Vol. XLIV., pp. 716, 762, 808.
† *Ibid.*, Vol. XLIX., p. 856. ‡ *Ibid.*, Vol. LIII., pp. 761, 854.

the comparative trials. Hence some of the statements of results are often rather vague. Thus M. d'Allest found that 1 lb. of refined petroleum evaporated 12·02 lbs. of water, while only 6·5 lbs. were evaporated per pound of a rather poor steam coal. The American results with crude petroleum and Pittsburgh coal gave respectively 15 and 7·2 lbs. of water per pound of fuel. Professor Unwin has recently compared petroleum with Welsh coal in steam-raising; the oil being injected by a steam-jet through a highly heated coil, and then burned perfectly with a clear flame. In his trials with a not particularly efficient boiler, he found that 12-16 lbs. of water were evaporated per pound of petroleum; and this result he considers about 25 per cent. better than that afforded by the steam coal. These results agree with those of M. d'Allest so far as the effect of petroleum is concerned; but the coals compared were different in value for steam-raising. Hence, for an average coal, the proportion is nearly 3 : 1.2—in other words, the practical heating effect of one ton of coal can be obtained by the combustion of only two-thirds of a ton of petroleum; while the comparison with the heavy oils would probably be still more in favour of liquid fuel. Petroleum has another advantage over coal in the matter of storeage room, as one ton of the liquid occupies only four-fifths of the space of the same weight of coal. So that the bulk of the petroleum required to perform the same work in heating as one ton of average coal is little more than half that of the latter. It follows that a steamer constructed to carry 1000 tons of coal could, if provided with suitable tanks, carry 1200 tons of petroleum, equal in fuel value to about 1900 tons of coal. In addition, the liquidity of petroleum permits it to be pumped and conveyed long distances by gravitation in tubes, so that its transport in bulk and in detail is easy. Therefore petroleum is not only a much more concentrated fuel than coal, but it is eminently portable as well, and convertible with greater facility into permanent gas. Against these advantages must be set the inflammability of petroleum, and consequent greater risk of fire.

Now we have to consider the question of relative cost of petroleum used as fuel in liquid or gaseous form as compared with coal—the latter being our standard for reference as in the case of peat. We have already seen that about two-thirds of a ton of petroleum can do the same amount of work in heating as one ton of coal. Therefore petroleum when burned directly cannot economically replace coal unless two-thirds of a ton of the liquid can be purchased for less than the cost of one ton of coal. We know the cost of ordinary lamp petroleum in these islands is at present far beyond that limiting value. Even the heavy oils which are not good enough for lamps, and yet are too "thin" for lubricants, only compare favourably with coal where the latter has to be carried long distances, and is therefore dear. However, all practical difficulties having been overcome in the use of these heavy oils for steam-raising, a comparatively small advance in the general price of coal would at once render them economical for industrial use as fuel.

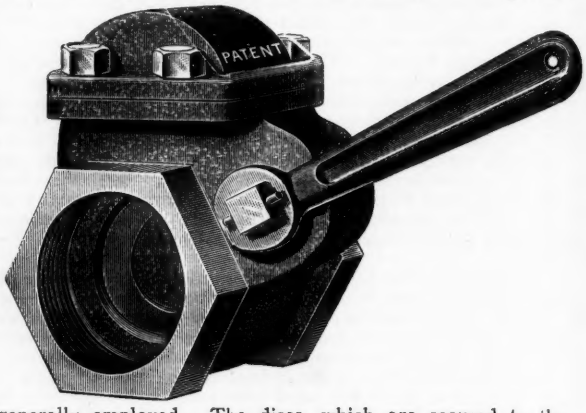
But when we compare petroleum gas with ordinary coal gas, the comparison is much more favourable to the liquid fuel. Unlike coal, petroleum is already more than half-way on the road to conversion into gas. As you know, one ton of coal affords about 9500 cubic feet of 16-candle gas. On the other hand, one ton of oil of specific gravity ·85 can afford about 24,000 cubic feet of gas, having an average illuminating power of 60 candles, or the equivalent of about 70,000 cubic feet of 16-candle value; and this rich gas admits of preparation on the small scale suited to country places, while the retorts used in the production of the gas can be heated by petroleum. The petroleum gas of some 60-candle power is said to be producible at about 6s. per 1000 cubic feet. If we were to assume that the calorific value of the gas is directly proportional to its illuminating power, the cost would correspond to about 1s. 7d. per 1000 cubic feet of 16-candle coal gas. But the facts do not justify the assumption, as the calorific value of methane is known to be greater than that of the heavier carbides to which the high illuminating power is due. Hence the comparison is probably less favourable to petroleum gas by about 25 per cent., though further experimental evidence is wanting on this point. However, even after this deduction, petroleum gas is the cheaper fuel as well as illuminant.

The necessary links between the elements of the trilogy on coal, peat, and petroleum are now, I think, sufficiently evident. If we desire to use each fuel in such a way as to develop most economically and conveniently its store of heat energy, we must first partially or perfectly gasify it. The newest member of the triad—petroleum—is the one which lends itself most easily and completely to such treatment, in consequence of its physical condition and chemical character. It is also the material that we must expect to facilitate the production of cheap gaseous fuels from coal and peat which shall at the same time possess sufficient illuminating power for most purposes. Chemical industries would probably benefit to a greater extent than others by the supply of cheap fuel of the kind in question. Hence I have ventured to tax your patience by dwelling on this topic in your presence to-day.

Mr. W. Woodall, M.P., has been appointed Financial Secretary to the War Office—a position practically similar to that which he held in this Department when the Liberal Government were last in office.

SKUDDER'S STRAIGHTWAY VALVE.

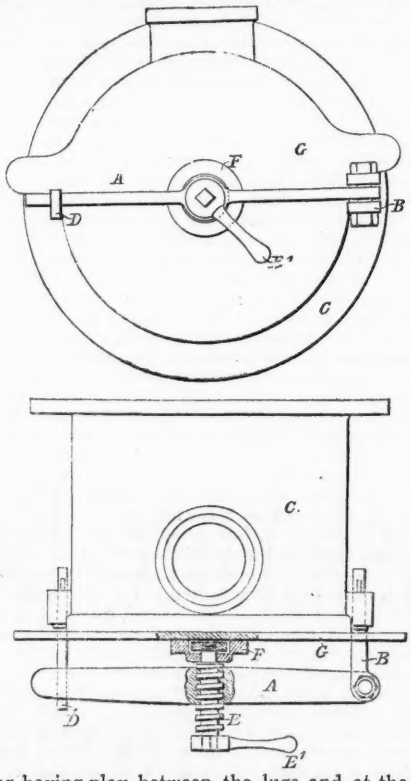
The accompanying illustration shows a form of straightway valve which has been patented by Messrs. G. Skudder and Co., of Tooley Street, S.E. It is a double-disc valve, operated by a detachable lever instead of the usual wheel, the position of which indicates the extent of the opening. The patentees claim for this valve, to which they have given the name of "Handy," that it is more compact than the ordinary globe or straightway valve; and that it is particularly suitable for pressures not exceeding 100 lbs. per square inch, in which case it could well replace the more cumbrous valves or stopcocks



generally employed. The discs, which are secured to the operating stem, are adapted to close against tapering seats in the valve-shell; and, being provided with ball and socket bearings at their back, they are evenly wedged against their seats when the valve is closed by the lever. The stem is furnished with a tapering flange, upon which bears a non-rotating friction washer, whereon the packing is compressed by the packing-nut. The necessary friction can be brought to bear on the stem, and thus prevent displacement of the discs and lever at any desired opening of the valve.

BOX'S NEW PATENT RETORT-LID FASTENING.

We illustrate herewith a very simple and yet effective arrangement of retort-lid fastening, the invention of Mr. W. W. Box, of the Crayford (Kent) Gas-Works. It will be seen that the ordinary cross-bar A is at one end jointed to lugs B, or to a bracket on one side of the retort mouthpiece C; and at the other end it is adapted to swing in behind a projection D on a lug or bracket on that side of the mouthpiece—the jointed end



of the bar having play between the lugs and at the joint pin. A screw-thread is formed through the middle of the cross-bar,

and a screw spindle E is fitted thereto, by preference with square thread, having at one end a handle E^1 by which to turn it, and being at the other end reduced in diameter. On this reduced part, there is loosely fitted a ferrule collar or boss F, with a flange or end face, which takes a bearing against the middle of the lid G, and which, when the screw E is turned down, is free to turn on the reduced end of it to the required extent, in order to give a fair and easy bearing on the lid, and yet so as to be easily released. In this way it is claimed that the lid is not damaged or put out of shape; and, moreover, it may conveniently be cut out of sheet-iron or (by preference) sheet steel. For holding the ferrule F in its place on the screw spindle E, it is recessed in its lower flanged part or face for a nut to lie therein; the nut fitting on a still further reduced end part of the spindle, screwed to suit the nut.

The Kirkleatham Arbitration Award.—On Saturday, the 13th inst., the Chairman, Solicitor, and Banker of the Kirkleatham Local Board waited, by appointment, on the Stockton and Middlesbrough Water Board, and tendered them the sum of £8006 for the purchase of certain water mains and fittings in the Kirkleatham district, in accordance with the award of Mr. H. Law, M.Inst.C.E., as directed by the Divisional Court of the Queen's Bench on the 1st of June last, as reported in the JOURNAL at the time. The Water Board, represented by Mr. D. D. Wilson (the General Manager) and Mr. Belk, declined the sum as tendered; and the matter will now have to await the decision of the Court of Appeal—to which tribunal, as already mentioned, it is to be referred—and probably that of the House of Lords.

Barnet District Gas and Water Company.—At the half-yearly general meeting of this Company to be held next Friday, the Directors will report that the balance of the profit and loss account amounts to £14,273, out of which they will recommend the declaration of a dividend, less income-tax, for the six months ending June 30 last at the rate of 8 per cent. per annum on the "A" and "C" stocks, 7 per cent. per annum on the "B" stock, and £5 12s. per cent. per annum on the "D" (water) shares. The Directors state that the business of the Company continues to progress. The quantity of gas made in the half year was 35,305,000 cubic feet, of which 32,788,000 cubic feet were sold, and 353,000 cubic feet used on the works. The residuals resulting from the carbonization of 3345 tons of coal (no cannel was used) were: Coke, 3186 chaldrons; breeze, 244 chaldrons; and tar, 38,467 gallons. The liquor produced 22 tons 5 cwt. of sulphate.

The Cost of the Electric Light at London Clubs.—With reference to a paragraph on this subject which appeared a short time ago, the Manager of the Westminster Electric Supply Corporation, Limited (Mr. E. Bax), has written to the daily papers to say that, with few exceptions, the clubs indicated are supplied by either the St. James's or the Westminster Company. The Directors of these undertakings did not see their way to making any further reduction in the charge for the light; and, as a result, the managers of one club availed themselves of a cheaper source of supply—with the consequence that there has been a total extinction of the light for something like ten minutes. "Failures in the past," says Mr. Bax, "have done much to check the progress of the electric light, and to bring it into disrepute. The endeavour to meet the demand for cheapness has frequently been the cause. But consumers are now beginning to prefer reliability to cheapness; and they find that the former is readily obtainable if a fair price is paid."

Sales of Shares.—At Guildford recently 174 fully-paid £10 shares in the *Guildford Gas Company* were sold by auction. The portion of the shares on which a dividend of 7½ per cent. is paid realized from £15 to £15 10s.; and those on which 7 per cent. is paid fetched from £14 5s. to £14 10s. The total amount produced by the sale was £2500.——Among a number of miscellaneous shares sold at Penzance a few days ago were 34 shares in the *Penzance Gas Company*, for each, of which £25 5s. was paid.——Some original £25 shares in the *Wakefield Gas Company* have lately changed hands at £62 2s. 6d. and £62 5s.——Several £10 shares in the *Grantham Water Company* (on which a dividend of 10 per cent. is paid) were disposed of in the locality last week at £26 apiece.——Some good prices have lately been realized, at a public sale at Calverley, for stock and shares in the *Calverley and Horsforth District Gas Company* and *Eccleshill Gas Company*. £25 of 10 per cent. stock in the first-named concern produced £63 15s., and £60 of 7 per cent. stock sold for £107 10s.; while 2½ £10 "A" shares, fully paid up, four "B" shares, £8 paid, and two "C" shares, £7 paid, in the Eccleshill Company, sold in one lot, fetched £127 16s.

The Management of the Evesham Gas-Works.—Owing to the resignation of Mr. H. Webb, the Manager of the Evesham Gas-Works, the Gas Committee of the Corporation had to give their attention to the selection of a successor. They decided to advertise for a suitable person; and they received 74 applications. These were referred to a Sub-Committee, who proceeded to consider them. They first of all decided to reject the candidates who asked for a higher salary than the one they fixed (£120 per annum to begin with); and to give the preference to those whose ages ranged between 25 and 40 years. Eventually they selected eight names; one being that of Percy Fletcher, although, being only 22, he did not come within the limit of age fixed. He had, however, been trained on the works, and his case was regarded as a special one. At the same time the Sub-Committee did not think he was old enough to bear the responsibility of the management. The eight names came before the Gas Committee; and they recommended the Council to appoint Mr. Fletcher on probation. This was regarded as a slight of the Sub-Committee, who had devoted a great deal of time to the consideration of the applications; and when the matter came before the Town Council, a suggestion was thrown out that all this trouble, as well as the expense of advertising, might have been saved. Eventually Mr. Fletcher was appointed probational Manager for a period of twelve months, at a salary of £90, and subject to dismissal at any time if his duties are not performed satisfactorily.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Gas Companies' Accounts.

SIR,—Your correspondent "Figures" must have read the summary at the foot of my letter without having read the letter itself, or he never could have misunderstood it in the way he has done. I am, however, glad to see that he agrees, like many others, as to the desirability, if not the necessity, of establishing something like a general standard to enable the companies to compare their several operations with each other. Electricity cannot yet be considered as an active competitor with gas. But nevertheless, as no one can foresee what may happen in the future, it would be a very imprudent proceeding to ignore it altogether, rather than strive to reduce the cost of making gas so as to compete with the electric light, in case it should ever become necessary to do so; and that there is a wide margin for improvement in this respect, with many of the smaller companies, it is impossible to deny.

Referring to your correspondent's letter, he says: "I can scarcely agree with Mr. Livesey that the division of the accounts into 'manufacture,' 'distribution,' &c., does not answer any useful purpose. On the contrary, it seems to me very useful." But how, or in what way, they are useful, he does not say. Gas companies are subject by law to certain limitations of profits; and all that the shareholders and consumers require or even wish to know, is that their respective undertakings are being carried on with due care and economy, and within the limits allowed by the law. The subdivision of the accounts under the headings of "manufacture," "distribution," &c., for this purpose is entirely useless. To judge by the proceedings at half-yearly meetings, they are never even referred to in any shape or way.

Your correspondent further says: "If the whole expenditure were lumped together as 'coals' and 'working expenses,' a variety of items over some of which the engineer has no control (such as rents, rates, directors' fees, &c.) would all figure as his 'working expenses;' and surely it is valuable to know whether the extra cost in any place arises at the works, in the district, or (as I may perhaps express it) at the office." Surely there is nothing in my letter from which it can be assumed that I ever suggested this. The words I used were: "And all the other items should be made into one total, and be charged as working expenses;" but I said nothing about "lumped together," and never had such a thought—being well aware that it would never be permitted. Under the limitation of profits, both the shareholders and the consumers are entitled to all the information necessary to convince them that their undertakings are being carried on with economy, and the adoption of all modern improvements; and if it can be shown that the present subdivisions afford any assistance in this respect, by all means let them be continued, but not otherwise. I object to them, because they are not only of no assistance in themselves, but, on the contrary, lead to confusion with others, and especially with small companies. Workmen are expected to be generally useful, and to do what they are told. Under such circumstances, it is impossible to allocate their wages and other charges correctly; and if this cannot be done in all cases, why have them in any? What could be easier than to say in the accounts—

Repair and maintenance—	
On the works	—
On the mains, services, and public lamps . . .	—
Meters	—
Stoves	—

A gas company, however large, is but one undertaking, with one object; and the entire profit made on that undertaking in one sum is all that can be reasonably required.

Your correspondent makes some other remarks about the accounts which I did not touch upon myself; but I fully agree with him as to the mode in which they ought to be dealt with. To go into the accounts generally, however, would lead me far beyond any space you could possibly allow me. I may, however, add that, if the accounts are made up correctly, the debtor side of the revenue account gives the total cost of all the gas made for that half year. If the quantity of gas sold in that half year is also given correctly, it is easy to calculate the cost per 1000 cubic feet; and, after all, that is the figure that ought to guide a company's proceedings. But the total cost in one item would not answer the object now in view. There ought to be two items at least—one for coals alone, and the other for working expenses. Coals may be given in one item; but working expenses should be stated in as many items as each company thinks fit, but certainly not in one lump sum.

W. LIVESEY.

Gas Companies' Association, 76, Palace Chambers, Westminster, S.W., Aug. 19, 1892.

Mr. Gadd's Mechanics.

SIR,—Your last issue, containing Mr. Milbourne's letter, has been brought to my notice. It seems quite clear to me, Sir, that if repeated sneer and insult can accomplish it, the free and fair discussion of the subjects put forward by Mr. Livesey will be prevented.

We have now—doubtless as a red-herring trail for the purpose of trying to cover a retreat from an utterly untenable position—to lug into the controversy, *for the first time*, the subject of "moment of inertia." The question of moment of inertia of the mass of the gas-holder has never been raised by me, or anyone else as yet, in this discussion; neither has it any bearing whatever upon the statical problem as originally laid down, wherein indeed the holder was considered, or supposed to be, *deprived* of all weight.

I have not the honour of knowing your correspondent, or his great attainments; but I grieve to say it is a very common deduction that persons who are so anxious to ascribe ignorance to others, are seldom themselves overburdened with knowledge. However that may be in his case, he cannot be permitted to indulge in what appears to me to be gratuitous and despicable metaphorical stone-throwing in public print, and then run away. *He* certainly assumes to be well versed in knowledge regarding the moment of inertia in "complex beams and canti-

levers." I therefore call upon him, as an honourable duty, to demonstrate: (*a*) What connection the moment of inertia of mass has with the problem before us; and (*b*) what is the meaning of the formula complained of, expressed in *terms* of the moment of inertia, and from what authority is the formula derived as applied.

Lest he should think it necessary to give me lessons, I will save his time by admitting at once that the moment of inertia of any body, about an assigned straight line, is the sum of the products of the *mass* of every particle of the body multiplied into the square of its distance from that line. I shall also readily accept the common formula, of Heppel, for symmetrical figures with a neutral axis in the centre—

that $I = \frac{2 \Sigma B \Delta (d^3)}{3}$. Also that the moment of inertia of *a circle about a diameter* is $M \frac{r^2}{4}$. Therefore he need not worry himself regarding my dreadful incapacity, but get on with his argument.

The formula complained of was expressly put forward by the compiler to locate the "centre of pressure" over the supports of a figure deprived of weight. So that it is Mr. Milbourne who appears to be seeking to "apply it to a question for which it is clearly not intended." It is for him to determine whether this is honestly done. I have not the requisite data, at present.

W. GADD.

Manchester, Aug. 18, 1892.

Gas v. Steam Engines for Driving Exhausters.

SIR,—Referring to the question in last Tuesday's JOURNAL as to the use of gas or steam to drive exhauster engines, I am at one with Mr. Whimster in the sentiment which prompts him to use gas for every possible purpose about a gas-works; but when it comes to practice, I think he, and anyone else who studies the question, will find himself bound to decide in favour of steam. I freely admit that, under some exceptional circumstance, a gas-engine may, and in many cases does, perform the work required in a satisfactory manner; but at the same time, having myself recently had to decide on this question, I will, with your permission, state briefly the reasons which forced me to take the course I did.

I approached the matter with a strong bias in favour of a gas-engine—thinking, as Mr. Whimster does, that such a motor is a proper thing in a gas-works; but I found (and I should be pleased, if necessary, to supply the figures) that the first cost of the engine and regulating apparatus was much more than the combined cost of a steam-engine and boiler. The cost of attention would be practically the same, and would fall on the principal stoker, night or day; but the cost of repairs and oil was greatly in favour of the steam-engine. Then, again, in the case to which I refer, a steam-boiler was an absolute necessity, as steam was in use for making sulphate; for occasionally steaming the pipes, washer, or condensers; and, in winter, for thawing the purifier lutes or gasholder tank. It would also have been necessary to provide power for pumps and other purposes, which could not in this case be worked from the exhauster engine. Add to this the fact that, coke being a drug in the market, all the steam could be, and is now, generated by means of ash-pan and other breeze, which could not be sold profitably, and it will be seen that while, for hoisting oxide or lime, for coke-breaking and other intermittent work, gas-engines have no equal, for regular exhauster work some cases at any rate will occur for which they are not suitable.

F. C. HUMPHRYS.

Ilkeston, Aug. 19, 1892.

Smokeless London.

SIR,—Allow me to protest against the extraordinary and sweeping remarks of Mr. L. C. D'Oyle in your last issue. His statements that designers and makers of new and special heating appliances do not need much knowledge or high mathematics, and his curious ideas as to proportions of gas and air, and burners which are perfection, can only be the outcome of want of knowledge of the people and the subject he writes so freely about. He seems to be labouring under the delusion that all gas is alike. The problem which is constantly turning up—*i.e.*, the calculation of the proportions and details of different burners, for qualities of gas varying in composition, and also from 0 to 65 candles in illuminating power—is one requiring a very much greater knowledge of mathematics than Mr. D'Oyle has any conception of; and this is only one out of very many to be dealt with.

There are undoubtedly many makers of gas appliances who, like the quacks in Mr. D'Oyle's own profession, live on their impudence, and by appropriating the designs and work of others; but to class all down to this level would be as reasonable as to class the whole medical profession as ignorant charlatans. If we were all on the level at which Mr. D'Oyle so confidently places us, the position of this special industry would be a very different one to what it is at the present time.

THOS. FLETCHER.

Warrington, Aug. 18, 1892.

SIR,—Surely Mr. Lynn Cyril D'Oyle does not claim novelty for the project he describes in the *Gentleman's Magazine*. Probably most of your readers are aware that the original projector of removing the bane of London winter life—the smoke-fog plague—is Mr. Thwaite. Mr. D'Oyle can scarcely have failed to hear of the project, which I remember Mr. Thwaite describing in his lecture on "Gaseous Fuel" at the Association Hall, Manchester, some three or four years ago. Since then the project has been fully set forth in *Industries*, and has more recently been illustrated in the *Daily Graphic*; and it has been referred to in most of the provincial papers.

Mr. Thwaite's project was, in principle, merely an artificial imitation of the national gas distributing system of America; and it had practically nothing in common with Sir W. Siemens's proposal, which was, I am afraid, absurd in principle. Fancy anyone proposing the establishment of a gas-generating plant down in a coal-mine, and in a possible atmosphere of marsh gas! The only deviation from Mr. Thwaite's scheme which is initiated by Mr. D'Oyle, is the heroic proposal to distribute an explosive mixture of air and gas—a proposition which no one who has had any practical experience in the use of combustible gas would make.

DAVID H. NOAR.

25, *Market Street, Manchester, Aug.* 19, 1892.

A Suggestion for Improving the Status of Meter Inspectors.

SIR,—Would you kindly allow me, through the medium of the JOURNAL, to point out one or two obstacles to a general adoption of the proposals contained in Mr. Keillor's paper on "Keeping Down Consumers' Complaints," read at the recent meeting of the North British Association of Gas Managers? (See *ante*, p. 252.)

In the majority of gas companies, the class of men employed as index-readers are not such as have sufficient education to discuss intelligently semi-scientific subjects with a man who may have had a university training. The greater number of them enter the service of the companies as labourers; and, after a certain length of time, they are raised to the dignity of assistant fitters—combining with this occupation the duties of index-reader, &c. The remuneration is on a scale that totally prevents the manager from being accused by the directors of extravagance in this department. I know personally of companies who pay "fitter meter inspectors" magnificent salaries—ranging from 24s. to 30s. per week! Now, it will be easily seen that men of intelligence, such as Mr. Keillor refers to, can command something better than this; and therefore most of the men of this class who recruit our ranks are those who have been failures in some other business.

I entirely agree with Mr. Keillor that we require men of erudition; and, as a counterpoise to the obstacles enumerated, I would suggest that a society be formed, subject to The Gas Institute, with power to hold competitive examinations and grant certificates to successful candidates. I would further propose that these examinations should be classified, so that a man who is well up in knowledge appertaining to his profession may obtain a certificate which would qualify him for a superior position. The subjects treated in the lower class should be: Practical gas-fitting, the adaptation of gas-burners, elementary physics, and the first principles of chemistry. This would be a great inducement for well-educated youths to enter the business. Of course, the pay would have to be increased accordingly; but this would be compensated for by the extra interest taken by the men in their work. As it is at present, there is absolutely no encouragement for zeal; and the object of most of the men is to knock off their work as quickly as possible.

I trust this matter may be taken up by gas managers.

METER INSPECTOR.

Aug. 16, 1892.

The Proposed Gas Exhibit at the World's Columbian Exhibition.

SIR,—I regret exceedingly to be obliged to bring to your attention a communication just sent in to the American gas journals for publication. The communication is self-explanatory, and requires no comment at my hands.

It is an additional source of regret to the Council that the gas engineers from foreign countries visiting the Chicago Exhibition will not there find always open to them a special gas head-quarters. We believe, however, that the hospitality of individuals will, in a measure, compensate for this lack of general action.

ALEX. C. HUMPHREYS,
Secretary, Gas Industry Council.

Philadelphia, Aug. 8, 1892.

[ENCLOSURE.]

To the Gas Companies of America and the Interests allied with the Gas Industry.

A Special Meeting of the Gas Industry Council was called to be held in New York on the 4th inst., to consider the question herein referred to. To this meeting, in addition to the members of the Council, were invited all the gentlemen who had been connected in the first place with the organization of the Council, including the American Gaslight Association Committee, and also some other members of the industry who had taken special interest in the work of the Council.

The following members of the Council were present: Eugene Vanderpool, Wm. Henry White, W. H. Bradley, Wm. M'Donald, and Alex. C. Humphreys. Also C. W. Blodget, Geo. G. Ramsdell, C. W. Isbell, and J. P. Harbison.

After full consideration of the questions involved, the following preamble and resolution were adopted; the vote being taken by calling of the roll, and all those in attendance (as above) registering their votes in the affirmative:

Whereas—In view of the fact that, after persistent effort on the part of this Council, by general circular letters addressed to, and the personal solicitation of, the various gas companies and manufacturers, to secure funds for the purpose of having a special gas exhibit at the World's Columbian Exhibition, to be held in the City of Chicago in the year 1893, that but $71,580·28 has been subscribed by the gas companies and allied interests, and there being no prospect that this amount can be sufficiently increased to warrant this Council in continuing its efforts to secure such an Exhibition; be it therefore

Resolved—That the Gas Industry Council return their thanks to the several subscribing companies and manufacturers, and do adjourn *sine die*.

In making the announcement of this action, the officers of the Council are instructed to make the following statement:—

The Council has presented to those interested in the gas business of America its scheme for special representation at the World's Fair, and has, in season and out of season, urged those appealed to to supply the necessary financial backing. Circulars have been persistently used; and the members of the Council have individually canvassed for the support required. Much work has also been performed by members of the industry outside of the Council. The case has been fully presented to the Gas Societies; and the following passed resolutions warmly endorsing the scheme in general, and the course taken in connection therewith by this Council: The New England Association of Gas Engineers; the Western Gas Association; the Ohio Gaslight Association; the Society of Gas Lighting; the Gas Club of Chicago. The American Gaslight Association has held no meeting since the organization of the Council; but the Association has given its endorsement through its officers and its special World's Fair Committee, which Committee co-operated in the organization of the Council.

But, in spite of the endorsement of these Associations, and the assurances received from individuals, the response has been lukewarm, and far from general. The failure to thus respond has been in many cases accounted for by explanations which did not explain, and which still left the full burden of responsibility upon those so withholding their support. The Council now wishes to refer to the full subscription list, and to respectfully fix the responsibility for the failure on those gas companies and those concerns interested in our industry, whose names do not appear on that list.

As the question will arise, especially in the minds of some of the subscribers, "Why did not the Council do as much as possible with the funds subscribed?" the answer is given at once. This question was fully considered by the Council, and discussed with many of the heavier subscribers; and the opinion was found to be almost unanimous that, in view of all the surrounding conditions, a meagre and incomplete exhibition was liable to work more damage to the industry than the entire abandonment of the scheme. And this decision was arrived at having fully in mind the seriousness of the entire absence of a special gas exhibition.

The Council begs leave to express the belief that, in the near future, those who are responsible for this failure will agree with the Council that the gas men of America have been guilty of a great blunder.

In conclusion, the Council wishes to draw attention to the fact that it secured from the World's Fair management the necessary recognition and assignment of space; and this, though late in the field, and also in spite of a general lukewarmness most inexplicable, secured subscriptions amounting to more than $70,000.

While the Council feels satisfied with its efforts and the results obtained in the face of such indifference, it regrets most deeply the failure now announced, for which it is in no way responsible.

EUGENE VANDERPOOL, President.
ALEX. C. HUMPHREYS, Secretary.

The Hartley Reservoir of the Plymouth Corporation.—The reconstruction of the northern wall of the Hartley reservoir of the Plymouth Corporation has just been finished; the cost having been £1700. The Water Committee have had considerable trouble with this reservoir through leakage, which, previous to the rebuilding of the wall, was 60,000 gallons daily, but is now about 80,000 gallons. According to the Water Engineer (Mr. Sandeman), the new wall was not intended to stop the leakage, but to prevent the old one coming down; and he is inclined to think that the leakage is due to the rotting of the foundations of the outlets. As soon as the Water Committee are justified by the weather and other circumstances in proceeding with the erection of the other walls, they propose asking the permission of the Council to do so.

Watford and the London Water Supply.—Some anxiety is being manifested in Watford, says the *Standard*, over the proposals of the London County Council to tap this district for the purpose of the Metropolitan Water Supply. It is pointed out that the district is already severely drained, and that the volume of water is gradually diminishing. Besides the Watford Local Board, who supply the town itself, there are wells belonging to the Colne Valley Water Company, the Rickmansworth Water Company, and also private water-works; while, in addition, the London and North-Western Railway Company have sunk a well, and are taking an enormous quantity of water for the purposes of the railway. The Hertfordshire County Council have declared that the county is not able to spare any additional supplies for London. Already the water in the district is failing—to such an extent, indeed, that it is necessarily being gradually less used as a motive power for machinery. The question is of vital importance to Watford, not only from the standpoint of the private consumer, but also in the interests of Watford's fame as a brewing centre. The foregoing facts were laid before Mr. R. E. Middleton, M.Inst.C.E., who recently held an inquiry in connection with the Royal Commission on Metropolitan Water Supply.

Gas and Electric Lighting at Prescot.—A special meeting of the Prescot Local Board was held last Tuesday to decide whether during the coming winter the town should be lighted by gas or electricity. The Clerk (Mr. H. Cross) read a tender from the British Insulated Wire Company, which stated that the light they would supply would be solely by means of electricity. They proposed to erect 10 arc lamps of 2000-candle power, and two arc lamps of 500-candle power, which would be placed at the junction of the most important streets, and 70 incandescent lamps of 12-candle power, which would be erected in the back and smaller streets. The arc lamps would be lit from dusk to midnight; and the incandescent lamps from dusk to sunrise. The Company would guarantee to efficiently light the town for £350 per annum, to be paid in quarterly instalments, on a contract for five years. The Clerk also read a tender from the local Gas Company, who offered to light the district for the ensuing season for 4s. per 1000 cubic feet (less 10 per cent. discount) on the average meter system. It was stated, in the course of the discussion, that the total cost last year of lighting by gas was £304 7s. 8d.; whereas, with the keeping of the lamps in repair, the cost of electricity would be £402, or an increase over gas of £97 12s. 4d. It was agreed to accept the tender for electric lighting.

Remarkable Discovery of Coal in Lancashire.—A few days ago, a remarkable discovery of a valuable seam of coal, known as the Great Mine, was made at the Ashton Moss Colliery, Ashton-under-Lyne. The owners have since prosecuted their search; and they are now able to give an approximate, if not strictly accurate, idea of the extent and importance of their find. The seam, which lies upon a thick bed of excellent fire-clay, at a depth of 32 yards, will, at the lowest computation, add to the known available coal supply no fewer than 50,000,000 tons. In the published section of the Lancashire and Cheshire coal-field, the Great Mine is marked as being worked out; but this now proves to be incorrect. Hitherto the extent of the fault which has been come across in the working at this colliery has not been known; but it is now proved to be 480 yards. The proprietors, after this remarkable discovery, are searching for the Furnace Hill Mine, which is marked on the geological chart as being 35 yards below the Roger Mine; and it cannot be doubted that this seam is within 10 yards of the roads already made at the colliery. The Furnace Hill Mine having been reached, they will, it is understood, at once search for the valuable seam of cannel lying about 50 yards below the Black Mine. Operations for working the new field were commenced last Tuesday.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice calling the meeting, and the report of the Directors and the statement of accounts (the principal portions of which were given in the last two issues of the JOURNAL) were taken as read.

The CHAIRMAN said that the first thing he had to do was to draw attention to the accounts, upon which, however, there was very little to remark, except in regard to the salient features. First of all came the question of coal, the cost of which had been about 1s. 2d. per ton less than in the corresponding period of last year. While, however, coal had been cheaper, coke, unfortunately, had also been cheaper; and, as stated in the report, they had lost on this something like £21,245. In fact, while coal had cost them 1s. 2d. per ton less, they had lost 1s. 1d. per ton on coke; and therefore the saving on coal had helped them very little. It might be interesting to state that, from their low-water mark in June, 1890, when their profit was at the lowest (and from that time coal had been getting cheaper), they had practically derived no benefit from it; for, while in the half year to December, 1890, the cost of coal delivered into store was 14s. 11d. and last half year 13s. 7d., the net cost, after deducting the receipts from coke, tar, and ammonia, came to 5s. 2d. a ton for the December half of 1890, and 5s. 4¼d. for the past six months. In fact, they were rather worse off; for they had lost a little more on products than they had gained on coal in the last four half years. He believed, however, that he might say that they had a very considerable improvement in prospect. They had happily made their contracts for the next nine months at a considerable reduction; and he thought he might say that coke had been at its lowest—for, comparing last half year with the previous six months, he found their receipts from coke were rather better. They received in the past half year 5s. 4¼d. per ton for coke; while in the preceding six months they only realized 5s. 1¾d. Coke, therefore, had really improved a little in the past half year; while coal had certainly gone down, and was, he was happy to say, still doing so. They had also been enabled to get rid of the large stocks of coke which they had a year ago and also six months ago, and now they were clear. There was another item in regard to products which was not so satisfactory—that was, the question of tar. As it happened, they had been doing very well with tar in the past half year—having received for it 1s. 7¼d. per ton, as against 1s. 5d. a year ago. This comparatively good return, however, was not due, he was sorry to say, to its intrinsic value, but to the fact that they made contracts two years ago at a certain price; and, while tar had gone down, they had still been getting that price. He could not say that he regarded with any satisfaction the fact that the loss had fallen on their contractor. However, the contracts would be out in a few months; and then, unless a very great improvement occurred in the tar market (of which there were no signs), he was afraid there would be a considerable drop in the value. While on this point, he desired to deal with one of the products of tar—anthracene—which was the base of a considerable number of dyes that were now used. In fact, when anthracene was discovered, it practically drove out of the market vegetables dyes to a large extent, or at any rate it drove altogether out of the market the dyes whose place it took. Anthracene, some ten years ago, was sold at 4s. and 4s. 6d. a unit; to-day, it was only 9d. a unit. They were at the mercy of the speculators in, and of the purchasers of, anthracene, who seemed to be able to get it at any price they chose to offer. He must confess that he felt this was very unsatisfactory, particularly when it was remembered that anthracene was an article for which there was no substitute; and if the makers could but be wise in their generation, as many others were who had to deal with a product like this, they might command a fair price, instead of having practically to give it away. He believed that efforts had been made from time to time by the tar distillers to arrive at some agreement as to the price at which anthracene should be sold. The bulk of it went to Germany. The obstacle had always been The Gaslight and Coke Company, who had never joined with them in any way whatever; and he had been told repeatedly, by officials of gas undertakings and tar distillers, that it was by the action of their neighbours on the other side of the water that anthracene had been depressed. As to ammonia, he was happy to say that, while the price had gone down, they had been able to maintain their receipts from it at a reasonable figure by manufacturing sulphate. Here was a case where there was a competitor. Ammonia was one of the sources of nitrogen required for artificial manure; but there was another source—nitrate of soda—which was to be found in inexhaustible quantities in South America. This was a sufficient reason for the depression in the price of sulphate of ammonia—which, a few years ago, sold for £20 per ton, whereas its price now was only £10 a ton—although he did not think it was likely to go lower, as it would not pay to bring over nitrate of soda if it was at a lower figure. In June, 1891, they received for ammonia 1s. 3⅜d. per ton of coal; and in the past half year, they received ¼d. more—1s. 3⅝d.—notwithstanding the fact that the value of ammonia had dropped; but this had been through their making it into sulphate. At their Old Kent Road works, they had erected plant for the manufacture of sulphate of ammonia; and for the ammonia produced there, they had received 1s. 8d., whereas from their other works they had only derived 1s. 2d., per ton of coal. At East Greenwich, they were now putting up plant, which would be at work in the coming winter; and therefore they hoped to improve their receipts from ammonia. As regarded the sale of it, they took tenders, or they sold it to anyone who was ready to give them a fair price for it; but they did not employ in this matter any special broker, who might be selling the Company's products to-day, and buying someone else's to-morrow on his own account. They thought it better to sell to anyone who would buy it at the best price they could get. As to the subject of rating, something quite unexpected had happened in the half year. Five of the parishes had

re-opened the question of rating, which was settled in 1890 and the beginning of 1891. The shareholders might know that every five years there was a re-valuation of property in the Metropolis. The Company's rating was settled on that basis; but this spring the question was re-opened by five of the parishes claiming an increase on their rateable value. They had settled at a ratio, taking the rateable value over the various parishes, of 10 per cent. on the gas-rental in those parishes; but in the case of The Gaslight and Coke Company, which had carried on some expensive appeals, it was put by the Court at 15 per cent. on their gas-rental. The five parishes to which he had referred, or their surveyors, said to the Company: "We do not see why you should get off at 10 per cent. when it has been settled that 15 per cent. on the gas-rental is the proper rateable value elsewhere." The Company employed Mr. Ryde, a very able surveyor, who with Mr. Bush and himself attended the Assessment Committee, who met them in a very fair spirit. They showed that the circumstances as between their Company and The Gaslight and Coke Company were totally different; and that, while the latter charged 3s. 1d. for their gas, the South Metropolitan Company sold it at 2s. 6d. Therefore, possibly while 15 per cent. might be fair in the case of their neighbours, it would not be so in their own. The Committee accepted this view; and they put down the Company's rating to practically the old figure. Referring to the report, he said he thought the first paragraph spoke for itself; but a few remarks in relation to the second paragraph might be of interest. The notable event in the past half year had been the strike of the Durham miners, which lasted three months. Now, in all his connection with the Company —and the remark applied to his colleagues also—they had never known a strike of anything like this duration. There had been partial strikes previously in the Durham district, but never a complete cessation of work in the whole county of Durham, upon which London depended principally for its supply of gas coal, as did many other places. If they had been told they should have to face a cessation of the Durham coal supply for three months, it would have caused them very grave anxiety; and they would have been led probably to spend a considerable sum of money in laying in a large amount of coal. He was not sorry that the strike had taken place—in fact, he thought it was a good thing, because it had given them most valuable experience. It had shown them that, with a complete stoppage of coal supplies from Durham, there need be practically no anxiety. They always kept a moderate supply in stock. They had at the time when the strike began about five weeks' stock; and, as the report stated, they received offers of coal from all quarters—from Yorkshire, Lancashire, Derbyshire, South Wales, Scotland, and even from Germany; and they saw that, however long the strike might have lasted, they would have had no difficulty as regarded coal. They, therefore, found that they could look with equanimity on such an event. It was not, however, very likely to happen again—a strike of this sort being quite enough for one generation of pitmen; and until a new generation rose up, they would not think of another strike. It had cost them rather more than £7000 additional for getting coal elsewhere; but they certainly had expected it would have cost more. They did not like such a loss, because the £7000 or £8000, which was charged to revenue, just about equalled the deficiency on the half-year's working. On the other hand, they thought that the experience which the strike had given them was worth something; and there was no doubt it had shown this—that it was impossible, either by a strike or by any other means, to keep up the price of coal beyond its proper value. He might in this connection mention another subject. Instead of sending their steamers to the Tyne, they had had to send them to different places, and among others to Hull. It appeared that there were at that place federations of Unions—Seamen's and Firemen's, and other Unions, and some of their steamers happened to have non-union men on board, or some non-union men—for the owners were indifferent, and said they did not mind whether union or non-union men were employed. The agent of the unionists at Hull, however, boarded one of the steamers, and told the Captain that the men must belong to the Seamen's Union or else the "tippers," who loaded the coal, would refuse to do so. They did refuse to load in one case; and the Captain, not knowing what to do—being delayed 24 hours, and not having communicated with the owner of the vessel—put his men into the Union. This was reported to the Company, who at once communicated with their agent in the North, stating that they would certainly not approve of anything of this sort, but would rather submit to any inconvenience with respect to their coal supplies than that such tyranny should go on. Their agent, fortunately, was made of the right stuff, and so were the owners of the *Rosalind*. When this ship went to Hull she was absolutely blocked for a week by these men, who tried the same thing on one or two other vessels. But, by meeting them with firmness and determination, the men were beaten, as, he might say, they always would be, if employers had a good case, and had sufficient pluck and backbone to stand out. The men afterwards agreed to load the *Rosalind;* and she was sent back for one voyage, just to test them. The Company then took their business to Grimsby; so these men lost the work, and the Dock Company the business—the Directors of the dock at Hull being just as much to blame as the men. The Grimsby people were very glad to receive them. The next paragraph in the report to which he would call their attention was that relating to the consumption of gas; they had to announce a reduction of about ½ per cent. This was very unusual— in fact, it was a unique experience; for they did not remember any period when there had been a reduction in the consumption of gas as compared with the corresponding period of a previous year. But there were some things which might account for this. Early in the half year ended June, 1891, the weather was exceedingly bad—a very severe frost prevailing. Dividing the past half year into two parts, they found they held their own in the first three months. In these they sent out rather more gas than in the corresponding period of the previous year. But they lost ground in the last three months; so that they had to announce a reduction of ½ per cent., or, to be exact, a reduction of 0·56 per cent. They had, however, to look a little farther than the question of the weather; and he thought it was to be found in the increase of price—a proof that they were suffering again from the action of their neighbours on the other side of the river. That Company raised their price to 3s. 1d.; and this information was circulated all over London—whether by some Progressive associations, or others who were advocating the purchase of the gas undertakings by the London County Council, he did not know. A leaflet was published by these persons setting forth that the price of gas in London was 3s. or 3s. 1d. per 1000 cubic feet; and the information was circulated among their own consumers. He had very little doubt that it had influenced some of them to try and economize. At any rate, these were the facts: There was a reduction in the growth of the business, accounted for, no doubt, partly by the difference in the weather: but it had also taken place concurrently with an increase in price. The result seemed to him to be tolerably strong evidence that increasing the price of gas did tend to check the consumption, and that reducing the price tended to increase the consumption. They, therefore, felt very glad indeed that circumstances were changing; and they hoped it would not be very long—though, he was afraid, it would not be very soon—before they were able to reduce the price again. Still, there was nothing to be discouraged about. The fact that, taking three years, they had had an increase of 14·35 per cent. in the consumption—or an average of 4½ per cent. per annum—was as satisfactory as they could expect. The next paragraph in the report related to their workmen and their wages. It was thought it would be an interesting piece of information for the shareholders; showing that, while so much was said about the large dividends they received, or were supposed to receive, they were not obtained by underpaying their workmen. He must confess that, when these figures were taken out for him for another purpose, he was astonished (on working out the amounts) at the large average paid per man; but he thought the shareholders would feel it was satisfactory to know that their men were well paid. The character of the work done very much depended on the workmen being paid properly, and knowing and feeling that they were paid fairly and treated justly. There was no doubt whatever that, if a working man felt he was being justly treated, he would do his work well, with more spirit, and that he would put more heart into it than if he had a discontented feeling that he was not fairly treated. He might say again, in relation to the profit-sharing system which the Directors introduced three years ago, that they were as satisfied with it as ever. There was no doubt it was producing a good effect on their workmen. It was true a considerable number of them withdrew their bonus as it was declared; but many of them left it with the Company. In fact, he was astonished at the large number who left their bonuses in the Company's hands. Each year it had been nearly half the total number; and the fact that so many were thrifty was very much to their credit, and to the credit of workpeople in general. He believed that workpeople were often blamed for being thriftless when it was not their fault, as they had not opportunities of saving. The Directors were trying to do what they could to give their own employees facilities for exercising thrift. They took their savings, and allowed them 4 per cent. on them, and also 4 per cent. on the bonus they left with the Company. This amount was growing year by year. In the present accounts, to June 30, the amount stood at £26,961, besides a considerable sum that the workmen had invested in the shares of the Company. Captain Heathorn asked him to state that the average wages of their men in the winter were £1 15s. 3d. per week, and in the summer £1 12s. 5d. a week. In regard to the question of dividend, it must not be forgotten that in 1876 Sir Thomas Farrer said: "It will never do to allow these gas companies to go on increasing their capital and allotting it to their shareholders; thereby imposing a heavy burden on future consumers. We must, therefore, make provision that, as far as all future capital is concerned, the consumers shall not have to pay more than the current rate of interest for it." With this object in view, Sir Thomas Farrer, who was then Permanent Secretary at the Board of Trade, suggested the adoption of a Standing Order by Parliament that all new stock granted to gas companies should be sold by auction. The result of this was that the Companies had since raised their capital at very little over 5 or 5½ per cent. In their own case, they sold a considerable amount to their consumers at the beginning of this year; and the stock was taken by them at £240 per £100. It was therefore anomalous—in fact, totally incorrect—to say they were paying 13 per cent. dividend to these shareholders, or to any proprietors holding stock issued since 1876. It was true that the original shares were getting 13 per cent.; but where were the original shareholders? There was very little further for him to say, but he would give them two or three figures, showing the balance of profit. Going back to the December half of 1888, the balance of profit was £165,000; and the price of gas was 2s. 5d. They then had a considerable surplus. Then they reduced the price to 2s. 3d.; and in June, 1889, they had a profit of £136,000. In December, 1889, came the strike; and the profit was only £67,000. In June, 1890, the strike was also affecting them. The expenses of the strike cost the Company £100,000; but they had never wavered in their conviction that this was money well spent. In that half year—June, 1890—the profit came down to £59,000; and this was their "low-water mark." In December, 1890, they showed a profit of £98,000. In June, 1891, the amount was £88,000; so that they went back a little on account of the fall in coke. At December last, they had a profit of £125,000; and now it was £145,000. They had very good reason for expecting that, unless something totally unexpected and unforeseen happened, they would next December not only be enabled to pay their dividend, but also to add something to their reserves. He concluded by moving the adoption of the report.

Mr. J. EWART, in seconding the motion, said he thought they were justified in stating that the experience gained by them owing to the strike had been valuable, especially to the Directors; and he thought it would ultimately turn out advantageous to the Company. It had induced the Board to apply themselves to adopting every improvement and every economy that had been possible; and it had also had the further advantage of cementing their connection with their men. He therefore thought they might fairly assume that the prosperity of the Company really rested now on a broader basis than used to be the case, for the interest and active co-operation of their employees were enlisted on the side of the Company. Many such plans as their profit-sharing scheme had been tried, and had worked well for a time; but, afterwards, when the bonus had to be reduced, such schemes had resulted in failure. In the case of their Company, however, they had

passed through a similar experience, in consequence of the rise in the price of gas necessitating a reduction in the bonus paid to the men. The latter had, however, acquiesced in this without any complaint; and they appeared to be as much attached to the scheme as they were in the early days. He thought that on all these grounds, and now that they had passed through their troubles, they were in a very much stronger position than before.

Mr. T. A. GREENE said they they must all regret to see the reduction of ¼ per cent. in the consumption, owing, as the Chairman had said, to the rise in price [The CHAIRMAN: Not entirely.] to a very large extent. It was clear to all who were cognizant with gas matters, that it was the last candle, or the last two candles, that caused the extra price that was charged. He was strongly of opinion himself that the object of gas companies should be to supply gas to consumers of light rather than to consumers of fuel. The question was whether it would not be better to reduce the illuminating power of the gas. Of course, this was a matter that would require a great deal of consideration by the Directors, because it would have to be brought to the knowledge of the London County Council. They would have to be approached to see whether the London gas could not be reduced from 16 to 14 candles, which, he believed, was the illuminating power a few years ago; and why should not people go back to 14-candle gas, with the improved burners now in use?

The CHAIRMAN said he was greatly obliged to Mr. Greene for his suggestion, for it was very much to the point. It was not, however, a question for the Company. The extra candle mattered very little to them; but it did matter very much to the consumer. It was practically no advantage to him, although he had to pay a great deal more for it—twice as much, at any rate, as it was worth. However, the difficulty would be to convince the public authorities of this.

The resolution was unanimously adopted.

The DEPUTY-CHAIRMAN (Mr. John Mews) then proposed the payment of the dividend recommended.

Captain HEATHORN seconded the resolution, which was unanimously carried.

Mr. EDWARD HORNER moved a vote of thanks to the officers; the compliment being acknowledged by the CHIEF ENGINEER (Mr. Frank Livesey) and the SECRETARY (Mr. Frank Bush).

Mr. MACE afterwards proposed, and Mr. MORTON seconded, a vote of thanks to the Chairman and Directors.

The CHAIRMAN, in reply, stated that the Directors highly appreciated these expressions of confidence half year after half year; and he could assure them that they did not take them as a matter of form. He could only say that he did not think a better Board was to be found. They had on their Board two gentlemen who had been engaged in large commercial businesses; they had another member who was now a leading City merchant; they had a real Captain, late of the Royal Artillery—a gentleman who had seen service in the Crimea and in the Indian Mutiny; they had a good lawyer, whose advice would be very much missed by his colleagues; and they also had two engineers. He therefore thought he might say that theirs was a well-distributed Board. He had been rather thinking that the present times were very strange to them; there being very little to worry or trouble them. A year or two ago, when everything was going smoothly with the Maryport and Carlisle Railway Company, of which Sir Wilfrid Lawson was Chairman, that gentleman gave forth the following lines, which were no doubt his own:—

> Oh, don't the days seem dull and long,
> When all goes right and nothing wrong;
> And isn't life exceeding flat,
> When there's nothing at all to grumble at?

(Laughter.) That was nearly, though not quite, the condition to-day of the South Metropolitan Gas Company.

The proceedings then terminated.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Ordinary General Meeting of this Company was held last Thursday—Mr. Alderman E. LAWRENCE in the chair.

From the report submitted by the Directors, it appeared that the total revenue for the year ending June 30 last, was £598,010; and the expenditure £488,880, leaving a surplus of £109,130, which had been transferred to the credit of profit and loss. After deducting the amount taken for payment of the dividend declared last February, and the interest on the bond and debenture debt, there remained a balance of £49,576, out of which the Directors recommended a dividend for the past half year of 5 per cent. on the ordinary consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock.

The CHAIRMAN said the past year had been a singularly uneventful one; and they had pursued their way quietly, and, he hoped, with satisfaction to the shareholders, and without any very great cause of complaint on the part of their friends the consuming public. It would be seen from the accounts that there had been a rather larger expenditure on capital account this year; but this was inevitable, partly owing to the extension of the works at Linacre, and partly to the erection of a new gasholder at Garston. These two items constituted the principal portion of the capital outlay, which amounted for the year to the sum of £92,606; and he could not hold out any hopes of being able to cease for the present expending more capital, because they had to complete the works in hand at Linacre. He was afraid the occasion was not far distant when the necessity would be forced upon them of considering whether the time had not arrived for commencing the erection of works for the manufacture of gas at Garston, because, in spite of the electric light and its extension (which, of course, they saw taking place every year), the gas consumption still went on increasing; and, as long as this was the case, they were bound by their engagements to the public to provide for this growth. They could not, of course, wait until the actual consumption had exceeded their producing powers before preparing for a larger production. It took time to erect the works; and therefore it would become incumbent upon them, at no distant date, to take this matter into consideration. By referring to the accounts, it would be seen that, during the past year, the excess of consumption over the previous year amounted to rather more than 2 per cent.; and for the six weeks which had elapsed of the new year upon which they had entered, they found that the consumption in a somewhat smaller proportion was still going on. The total expenditure in making and distributing gas during the past year had exceeded that of the previous year by £39,276, the larger proportion of which arose from the increased price of coal. During the twelve months, they carbonized 317,000 tons, as against 309,000 tons in the preceding year; and the price amounted to 18s. 5d. per ton, compared with 17s. 2d. per ton. Wages were £2000 higher; and the maintenance of works exceeded the previous year by £2000, mainly owing to the fact that they had had to renew certain of the gasholders, a portion of the charge of which had been included in the year's expenditure. The renewing of the gasholders was a charge upon revenue, and one which they were fairly able to spread over three or four years. The parliamentary account was about £661 in excess, owing to their having had a Bill in Parliament; and their interest charge for the year was £3000 in excess of the previous year, which arose from several causes—one being that they had had a larger amount of debentures out. The increased income amounted to £55,212. At the commencement of the year, they raised the price of gas from 2s. 8d. to 3s.; the result being that it produced £59,415 more for gas sold and public lighting combined. The residual products had not been so satisfactory during the year. Their coke account showed a dimunition of £6781, which was a very large figure. This was accounted for by the bad state of trade. But the reduction of the consumption of coke was marked in every direction where it was employed for manufacturing purposes; and the consequence had been that not only had the prices declined, but the article itself had become an absolute drug on the market. One feature in the residual products was that of tar, which showed an increase amounting to £4657. This was the result of a contract which had been made and which was running for another year, though tar itself had gone down very much. The whole result of the year's working was such as justified entirely the action which the Directors took twelve months ago in raising the price of gas to 3s. The net profit made during the year was £96,875. The amount required for dividend was £95,933; so that, with the present price of gas, they had just come out with a whole skin, and a few pounds on the right side. As regarded the coming year, they would make no change in the price. The coal had been obtained at a little lower cost, probably something like 6d. a ton; but last year they started with a considerable balance of very cheap coal and cannel. They had no such advantage at the present day; and therefore they estimated that, during the current year the price of coal would remain at about the same as for the past year. Everything had been done to keep the concern in good working order; whilst at the same time every care had been taken to avoid anything like extravagance.

Mr. BATESON seconded the motion.

Mr. STOLTERFOHT remarked that he saw by the report of The Gaslight and Coke Company that they had found it to their advantage to restrict the quality of the gas, in consequence of the great increase of gas used for heating purposes and the improvement in burners. They were now no longer going to supply the high-class gas; and they had intimated to the consumers that henceforth they would only supply 16-candle gas. He did not know whether that would be applicable to this Company.

The CHAIRMAN said there was really no analogy between themselves and The Gaslight and Coke Company, as they were tied to their present quality of gas for the whole of the gas they supplied; and, unless Parliament sanctioned an alteration, they had no option but to go on supplying the same quality.

The motion was carried unanimously.

The dividend recommended was then declared; and the retiring Directors and Auditor having been re-elected, and the usual complimentary vote passed to the Chairman and Directors, the proceedings terminated.

BRISTOL GAS COMPANY.

The Half-Yearly Report and Accounts.

At the 79th half-yearly general meeting of the Bristol Gas Company next Friday, the Directors will report that the profits for the six months ending June 30 last will permit of the payment of the maximum dividend on the ordinary stock, provide for the interest on the debenture stock, and leave a surplus of £485, which, with the amount brought from the previous half year, and after carrying to the reserve fund the sum of £3240, will allow a balance of £4929 to go to the credit of the next account. The increase in the consumption of gas has, the Directors state, been steady and satisfactory; and, in order to furnish the necessary storeage room, it has been decided to erect a large holder at the Barton Hill station. A dividend at the rate of 5 per cent. per annum on the nominal capital entitled thereto will be recommended, subject to deduction for income-tax. The revenue account of the Company shows that in the past half year £91,498 was received for gas sold for private consumption, as compared with £88,065 in the corresponding period of 1891; the public lighting and supplies under contract returning £12,643, against £12,183. With regard to residuals, there was a falling off to the extent of nearly £1500 in the receipts for coke, though breeze fetched about £200 more; tar was £40 better; and ammoniacal liquor, £453 worse. On the whole, residuals were £1691 lower on June 30 last than at the close of the first half of 1891; though the total receipts were £1293 higher. On the expenditure side of the account, a sum of £52,826 was paid for coal, as compared with £49,448; all the other items of manufacture being higher, with the exception of repairs, which caused an outlay of £12,871, as against £16,373. In connection with the distribution of gas, the repair and renewal of meters and stoves cost much less than in the corresponding six months of 1891; the total of the three items under the above-named branch of the Company's operations amounting to £4363, as against £5296 in 1891. The total expenditure was about £1100 more; but the balance carried to the profit and loss

account is higher to the same extent. Turning to the working statements, the quantity of coal carbonized was 79,021 tons, as compared with 67,387 tons in the corresponding half of 1891. Of cannel, 8950 tons were used, instead of 18,464 tons—a very considerable reduction. The quantity of gas made was 804,950,000 cubic feet, as against 781,374,000 cubic feet; being 23,576,000 cubic feet more than in the first half of 1891. The total not accounted for was 71,005,414 cubic feet in the past half year, and 78,142,026 cubic feet in the corresponding period of 1891. The residuals produced in the six months ending June 30 last were estimated as follows. Ordinary coke, 50,940 tons; cannel coke, 5888 tons; breeze, 6818 tons; tar, 862,447 gallons; and ammoniacal liquor, 2,008,050 gallons.

CROYDON COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

In the report which will be submitted at the meeting of the shareholders of this Company to-morrow, the Directors state that there has been an increase in the quantity of gas sold, compared with the corresponding six months of 1891, of 12,636,700 cubic feet, equal to 5·88 per cent.; but they regret that coke and other residual products have been sold at greatly reduced prices. Referring to the strike of the Durham miners, the Directors mention that were they compelled to obtain coals other than those contracted for, at an extra cost of £896. There has been a considerable increase in the sales and supply on hire of gas-stoves for cooking and warming purposes, and a large number of cottages have been fitted up and supplied with gas under the prepayment system. The continued increase in the business of the Company, we learn, has necessitated the purchase of additional plant—viz., one of Kirkham, Hulett, and Chandler's "Standard" washer-scrubbers, engines, and a coke-breaker. The Directors have also entered into contracts for the purchase of more land; for the construction of another retort-house and coal-stores; and for the enlargement of some of the purifiers. These additions are estimated to cost about £17,000; and, as other outlay will shortly be required, an extraordinary meeting of the shareholders will be held after the ordinary meeting to-morrow, for the purpose of empowering the Directors to raise, from time to time, as required, further capital to the amount authorized by the Company's Acts. With regard to the financial results of the half year, the unappropriated balance amounts to £18,661, out of which sum the Directors recommend the payment of dividends at the rate of 14 per cent. per annum on the capital of £51,600, and of 11 per cent. per annum on the capital of £142,500 (less income-tax). These dividends will amount to £11,449, and will leave a balance of £7212 to be carried forward to the credit of next half year. The revenue account shows that £32,751 was received for gas; £1332 by way of rental for meters, stoves, and fittings; £9564 for residual products; and £64 for rents of cottages—making together £43,712. On the other side of the account, £26,508 was spent in manufacturing gas; £2193 in its distribution; and £607 in lighting and repairing the public lamps. Rents, rates, and taxes absorbed £1403; management, £1504; and sundries, £715. The total expenditure amounted to £32,931; leaving the profits for the half year at £10,780. As to the manufacturing operations, 21,584 tons of coal and 272 tons of cannel were carbonized in the half year; the quantity of gas made being 237,160,000 cubic feet.

CORK GAS CONSUMERS' COMPANY.

The report presented at the meeting of the Cork Gas Consumers' Company last Wednesday opened with a reference to the death of Mr. T. Mahony, who was one of the original Directors, and had shared in the guidance of the concern for nearly 36 years. On the death of the first Chairman (Mr. Maguire) in 1872, Mr. Mahony was elected to preside over the Company; and the Directors spoke highly of his untiring energy in furthering the interests of the concern during the years which have elapsed. To fill the vacancy on the Board, the Directors stated that they had elected Mr. F. W. Mahony, the late Chairman's son; while Mr. G. Lynch, a gentleman of many years' experience on the Board, had accepted the office of Chairman. Referring to the accounts, it was mentioned as a most gratifying fact that the rental for the half year showed the remarkable increase of £1087, as compared with the corresponding period. Of this, £1058 was attributable to private lighting, and only £29 to the public lamps. On the other hand, the cost of coal had been higher. This was partly to be put down to the expiration of the rather favourable contracts which were made before the great advance took place. The Directors were fortunate enough to get from the Company's own stores, and from other sources, a quantity of coal sufficient to tide them over the strike of miners in Durham. They also announced that they had again given notice to the Corporation of their intention to apply for powers to supply the electric light. Last year, while that body refused assent, they gave no reason for their refusal; and though such assent was not necessary, it was the desire of the Board to work harmoniously with the municipal authorities. The balance of profit and loss account was £5320. In order to pay the usual dividend at the rate of 8 per cent., a sum of £5701 would be required; and it would therefore be requisite to take £381 from the reserve fund. Twelve months ago £813 had to be taken from the same source, the greater part of which was recouped in the following half year. The reserve fund, after the above appropriation, would, it was stated, stand at £12,360. The Chairman (Mr. G. Lynch), in moving the adoption of the report, referred in feeling terms to his predecessor, whose sudden death took place very soon after the previous meeting of the Company. He said he was fully conscious of the disadvantage at which he was placed in following such a man; but he did not feel at liberty to shirk the responsibility his colleagues had thought fit to impose upon him. Though the great knowledge possessed by their invaluable Secretary (Mr. Denny Lane) on gas, electricity, and everything connected with their business, rendered the work of the Board comparatively easy, he considered it to be the duty of the Chairman to make himself acquainted with everything relating to its different departments, and to some extent to hold the reins in his hands. Turning from these personal matters to the report, he expressed his pleasure at being able to congratulate the shareholders on the continuing prosperity of the Company's business. The increase in the private rental for the past six months had, he said, been the largest experienced for many years past. The use of gas-engines was steadily increasing. As the Great Southern and Western Railway Company proposed to light their new station with gas instead of with the electric light, of which they had had several years' experience, it was probable that the present consumption of gas would be maintained or exceeded. It was with a view to this that the Company were laying a wrought-iron main across St. Patrick's Bridge. The space in the bridge being limited and rectangular, they had to adopt a main of similar form, so as to avail themselves, as far as possible, of the room at their disposal. Referring to the "friction" between the Company and the Corporation on the subject of the steam-roller which the authorities have lately introduced, he remarked that, knowing what accidents and losses had arisen from the employment of these machines, and how unsuitable some of the streets of Cork were for their use, the Directors felt obliged, for the protection of the Company's property, to give the authorities a caution. With regard to the electric light, the Company had again given notice to the Corporation of their intention to apply to Parliament and the Board of Trade for power to supply this illuminant. The Directors were satisfied that if the Corporation and the citizens generally wished to have the light, no one could supply it more economically and satisfactorily than the Company. In Waterford, where it had been supplied by an electric light company for five years, it was just being discontinued. They supplied it, as was generally believed, at a loss; and on the expiration of their contract they required so large an increase of price that the Corporation had given the Gas Company a contract for five years for lighting the entire city. The electric light would be extinguished in Waterford on the 1st of next month. In conclusion, he said he thought the Directors might fairly take credit for having, owing to the timely and judicious contracts they secured, passed through the recent crisis in the coal trade without advancing the price of gas. Alderman Madden seconded the motion, and it was carried. A dividend at the rate of 8 per cent. per annum was next proposed by Mr. J. O'Sullivan. Mr. S. H. Newsom, in seconding the motion, said he was a sufferer from the use of the steam-roller; it having broken a great many pipes in his street. He thought there was plenty of work for it without going into the small streets, where the gas-mains were near the surface. There were many roads in the city that would be benefited by an application of the roller, without any damage occurring to the gas-pipes. The proposition was carried; and, the retiring Directors and Auditor having been re-elected, the proceedings terminated.

PROVINCIAL GAS COMPANIES.

The following paragraphs contain the principal features of the financial statements and reports of meetings of the Gas Companies mentioned.

According to the statement made by the Chairman (Mr. Alex. F. Wilson) at the recent meeting of the Aldershot Gas and Water Company, the total increase of revenue in the past half year, as compared with the corresponding period of 1891, was £165; but this had been adversely influenced by the reduction in the price of gas since Christmas last of 2d. per 1000 cubic feet—the price being now 3s. 4d., as against 3s. 6d. at this time last year. Had it not been for this reduction, the extra revenue would have been £317. The total increase in the gas consumed had been 1,481,000 cubic feet; but in the town alone, it had been 1,334,000 feet, or about 8 per cent. upon the town as apart from the War Department consumption. The increase upon the whole consumption for the half year had been 5·3 per cent. The water pumped in the six months had been 80,053,000 gallons, as against 84,477,000 gallons in the corresponding period. But of this quantity the War Department had taken 7,898,000 gallons less than formerly; and consequently the town increase had been 3,474,000 gallons. New capital had been spent to the extent of £1036; and the capital account had been overdrawn in the sum of £1083. Regarding the future, he said they were still kept in suspense as to the possible needs of the Government for the new barracks; but they were nevertheless in a position to meet any moderate requirement, and time would have to be allowed them to increase their plant if the demand was very excessive. The report was adopted; and a dividend at the rate of 10 per cent. per annum on the ordinary shares, and of 7 per cent. per annum on the "B" shares, both less income-tax, was declared.

The statement of accounts for the half year ending June 30 last, which will be presented at the ordinary general meeting of the Bath Gas Company next Friday, shows a profit of £6309; and the Directors will recommend the payment of the maximum dividends. In the past six months there was only a very slight increase in the gas-rental, as compared with the corresponding period of 1891, when the prevailing weather was less favourable than that of the half year covered by the present accounts. The receipts for gas came to £26,289; residuals returning £5795. The total receipts were £32,976; and the expenditure was £26,667. The revenue from residuals was seriously affected by a decline in prices; but, on the other hand, the manufacturing expenses were lower. The stoking machinery which the Company have been erecting is completed, and will be ready for work in the coming winter. The quantity of coal carbonized in the six months was 20,413 tons; and 13,240 tons of coke, 1165 tons of breeze, 1011 tons of tar, and 224 tons of sulphate of ammonia (631,000 gallons of liquor) were produced.

The accounts of the Chesterfield Water and Gas Company for the half year ending June 30 last were presented to the shareholders at their general meeting on the 12th inst. The income for water amounted to £3723; for gas, to £4885; coke and other residuals yielded £910; and the total receipts were £9526. The manufacture and distribution of gas cost £2277; the distribution of water entailed an expenditure of £295; salaries and general expenses came to £625; rates and taxes, to

£833; and the Directors' and Auditors' fees amounted to £231. The balance of the net revenue account was £6623, of which £4448 would be absorbed in the payment of dividends.

In their report to the shareholders, the Directors of the Dover Gas Company allude to the period of anxiety through which they, in common with other gas companies, have recently passed, in consequence of the lengthy strike of miners in Durham, from which the Company draw two-thirds of their supplies of coal. But, owing to the trouble having been somewhat anticipated by laying in a larger stock of Durham coals than usual, and to the satisfactory relations existing between the Company and the firm which supply them with the remainder of their stock, they sustained no material loss or inconvenience. The report also mentions that the gas supply to the villages of Ewell and River has now been accomplished; and it is believed that this will ultimately prove beneficial to the Company. The balance of profit for the half year is £3082; and the Directors recommend the declaration of the full dividend at the rate of 7½ per cent. per annum (less income-tax), which will require £2705, and leave £377 to be carried forward.

The profits of the Faversham Gas Company for the past twelve months, after providing for income-tax, amounted to £1572, as against £1470 in the previous year. This, added to £246 brought forward, with interest on investments and profit on the sale of some Consols, made £1877, out of which a dividend of 6 per cent. has been declared.

The annual report of the Hartlepool Gas and Water Company states that there has been a steady increase in the consumption of both gas and water, notwithstanding the stoppage of works during the recent strike, and which has also caused a largely-increased expenditure in both departments. The Directors recommend the payment of a dividend for the past half year at the rate of 8½ per cent. per annum on the "A" shares, 7½ per cent. per annum on the "B" shares, and 7 per cent. per annum on the "C" and "D" shares, free of income-tax, which will leave a balance of £343 to be carried forward.

The annual meeting of the Kendal Gas and Water Company was held last Tuesday. Mr. W. M. Crewdson presided; and there was an unusually large attendance, which was doubtless owing to the fact that the collector (Mr. M. Thompson) had been arrested on warrant, charged with embezzling the funds of the Company. The Secretary and Manager (Mr. Edward Thompson) read the report of the Directors, who suggested, owing to the collector's defalcations, a dividend at the rate of 6 per cent. per annum, instead of 8 per cent. as hitherto, and that £2000 be withdrawn from the reserve fund to help to meet the deficiency. The Chairman, in moving the adoption of the report, said that up to a week ago the Directors had no doubt in their minds but that the accounts were absolutely correct. The collector had been twenty years in the service of the Company, was of orderly and regular habits; and they had never had any reason to doubt his honesty. On Tuesday last, however, there was evidence that there was serious irregularity; and the Directors called in Messrs. Jones, Crewdson, and Hewitt, accountants, of Manchester, to make a proper audit. Up to that time the defalcations were placed at £3688. The friends of the late collector had paid £250; and the total defalcations were reduced by that amount. In answer to a question, the Chairman said the Company had never held any security for the collector. The report was adopted.

The report presented by the Directors of the Kidsgrove Gas Company at the annual general meeting on the 4th inst., recorded sales of gas to the amount of 14,718,300 cubic feet in the year ending June 30 last, as compared with 13,493,300 cubic feet in the preceding twelve months; being an increase of about 9 per cent. This extra demand entailed an extension of the manufacturing and purifying plant, as well as additional storeage. The Chairman (Mr. J. Gater) moved the adoption of the report, and proposed dividends at the rates of 10 and 7 per cent. on the original and new shares. This was agreed to.

The shareholders of the Newport Gas Company held their half-yearly meeting on Monday of last week. The report submitted by the Directors stated that, in order to pay the usual dividends, it would be necessary to take £810 from the reserve fund. The receipts for the half year amounted to £18,656; and the expenditure, to £15,006—leaving a net profit of £3650. The expenditure on new works had been £903; and a contract for the erection of a new gasholder tank had been let to Mr. J. Linton, of Newport, for £10,140. The Chairman (Mr. E. J. Phillips), in moving the adoption of the report, stated that, although the revenue was not sufficient to meet the payment of maximum dividends without drawing from the reserve fund, the position of the Company was much better than in the previous half year. The Directors had entered into a new contract for coal, by which a saving of more than £2000 would be effected on the year; and this would enable the Company to pay their dividends out of the revenue account. The revenue had increased by £300 during the six months, whilst the quality of the gas showed an improvement. In addition to the gasholder tank, the Directors were also negotiating a contract for a new gasholder; and a telegram had been received that morning intimating that the contract would be accepted by Messrs. C. and W. Walker for £6600. To cover this expenditure, the Board proposed to offer to the public £10,000 worth of new shares. The report was adopted; and the maximum dividends were declared.

The half-yearly meeting of the Normanton Gas Company was held last Saturday week. In moving the adoption of the report and a dividend at the rate of 8 per cent. per annum, the Chairman (Dr. Statter) said the Company were still prospering; their increase in the matter of gas being about a million cubic feet per year. The output had been doubled in the last 15 years; and they were now constructing a new holder, which would entail an expenditure of about £2200. Referring to the unaccounted-for gas, which stood at 13½ per cent., he said that this was largely due to the workings for coal. The motion was adopted.

According to the report submitted at the meeting of the Sevenoaks Gas Company last Thursday week, the gross receipts for the past half year amounted to £5280, and the total expenditure to £3618—the profit for the half year being £1662. The balance of profit and loss account, after paying interest on the debenture stock, was £2556; and the Directors recommended the usual statutory dividends of 10 per cent. on the original capital, and of 7 per cent. on the additional capital, both less income-tax. The Manager reported that during the half year several beds of retorts had been renewed, and that the condition of the manufacturing apparatus and machinery, as well as the distributing plant, was satisfactory. The report was adopted.

The accounts for the half year ending June 30 last, which were presented to the shareholders of the Wellingborough Gas Company, Limited, at their meeting yesterday, showed a balance of £1563 to the credit of the profit and loss account. The sale of gas to private consumers in the six months produced £3326; and a sum of £176 was received for public lighting. The total receipts amounted to £4665; and the expenditure, to £3505—showing a balance of £1160. The quantity of coal carbonized was 2295 tons; and 23,099,500 cubic feet of gas were sold. The residuals were: Tar, 27,684 gallons; ammoniacal liquor, 42,320 gallons. The production of coke is not given; but 1380 tons were sold in the six months. A re-arrangement of the plant is now in progress; and as a good deal of the expense of this was chargeable to revenue, the profits for the half year were somewhat reduced. The Directors, however, recommended a dividend of 5½ per cent., free of income-tax.

The half-yearly meeting of the Wakefield Gaslight Company was held yesterday week. The Chairman (Mr. W. Statter), in moving the adoption of the report and statement of accounts, said that the concern was in a flourishing condition, and the works were in first-rate order. To provide more storeage room for gas, they were having a third lift added to each of their three holders; and by this means they would save the expense of constructing another tank. The cost of this work would be about £5000. They were also fixing another station-meter, at an outlay of £750. During the past half year, they had made 116,436,000 cubic feet of gas, an increase on the corresponding period of 1,788,000 feet, notwithstanding that they had used less coal. The receipts for gas were £12,287, which was £650 less than a year ago, caused by the price having been reduced from 2s. 8d. to 2s. 6d. per 1000 cubic feet. They had also received £462 less for their residual products. It required £5203 to pay the usual dividends; and as the profits for the past half year were only £4557, there was a deficiency of £646, which the Directors proposed to take from the surplus of £1998 brought forward, reducing it to about £1300. Mr. W. Briggs seconded the motion; and it was carried. The usual dividends of 11½, 9, and 8½ per cent., free of income-tax, were declared.

Sulphur in London Gas.—Mr. Dibdin's return for the week ending the 13th inst. shows that the gas of the South Metropolitan Company no longer contains sulphur in excess of the quantity allowed, but that The Gaslight and Coke Company are now being troubled with this impurity. At the Fulham testing-station on the 8th inst., the mean of the testings was 21·8 grains of sulphur per 100 cubic feet of gas; on the following day, it was 25·7 grains; and on the next day, 25·8 grains. On the 11th inst., however, it was only 18·9 grains. On the first-named day, the illuminating power of the gas at the Camden Town station was recorded as 15·6 candles.

Improvements at the Salisbury Water-Works.—A special meeting of the Salisbury Town Council was held last Thursday week, to receive and consider the minutes of the Water Committee relative to suggested additions to the water-works. It appeared that the Committee recommended the acceptance of a tender of Messrs. Easton and Anderson for a new boiler, engine, and pumps, at a cost of £2405; and it was proposed, with the sanction of the Local Government Board, to borrow £4500, to be repaid in twenty annual instalments—the extra money being required for the sinking of a well recommended by the Surveyor. The Corporation have already pumping machinery capable of raising 32,000 gallons of water per hour; but since this was laid down in 1857, the population has vastly increased. With the new machinery, they will have the means of raising an extra 70,000 gallons. The report was adopted.

Dissatisfaction among the Gas Workers at Bury.—In consequence of the men employed at the Bury Corporation Gas-Works having received notice of a rearrangement of the duties and payments decided upon after the strike in 1889, they threatened to again leave work. The old arrangement was that the men were to have 5s. per day for attending to five fires for eight hours; and they were assisted by coke wheelers, patchers, and pipe jumpers. Recently it was proposed to resume the use of automatic stokers, and to require the men to wheel their own coke, and to patch and clean the pipes, as well as to attend to six fires, instead of five. The men declined to accept these conditions; and they served a fortnight's notice. The matter, however, was amicably arranged last Thursday. The men's Secretary (Mr. Connor) wrote to the Gas Manager (Mr. W. H. S. Gendall), submitting two lists of rules in force at Burnley, either of which the men were prepared to work under, and one of them was accepted. The terms are that two men will draw and charge 48 retorts per shift, look after two fires, and wheel the coke and do everything required for four beds of six retorts each, for 5s. 3d. per shift of eight hours, which is 1⅛d. per retort charged and drawn, and 1s. each for two fires.

The Haggerston Gas-Works in Danger.—A very destructive and alarming fire broke out early on the morning of the 15th inst., among vast stores of wood on the banks of the Regent's Canal at Haggerston. Many tons of valuable timber were destroyed; the extent of the damage being estimated at £10,000. Serious as was the destruction, it might have been much more so had the wind been in a different quarter. The immediate proximity of the Haggerston Gas-Works naturally caused great anxiety; for at one time the flames were blazing within 25 feet of one of the gasholders. The authorities of the brigade concentrated a portion of the force at this side of the fire; and the steamers kept pouring such floods of water on the flames that all danger of the mischief spreading to the works was obviated. The officials of The Gaslight and Coke Company, too, hurriedly took precautionary measures by turning the gas into a distant holder; and a further measure of safety was to keep a steam fire-engine in the yard. It was late in the day before a portion of the force of engines and men engaged could cease work and proceed to their respective stations; but fortunately their services were not required for any of the Gas Company's property.

GAS AFFAIRS IN BRUSSELS.

In the JOURNAL for the 2nd inst., we gave some extracts from a letter received from a correspondent in Brussels dealing with the position of the Belgian Association of Gas Managers, especially with regard to certain dissensions which threatened the existence of the organization, and more particularly with that portion of its work which has probably been of the greatest service to the gas industry of Belgium—viz., the exhibition of gas appliances on the Boulevard du Nord in Brussels. The closing of this exhibition at a no very distant date was then regarded as among the possibilities; and later advices seem to indicate an earlier dissolution than was anticipated. Of course, the exhibition could not be kept going without funds; and those of the Association alone would scarcely have been equal to bearing the expense of the show had they not been assisted from outside sources. We believe it was at the instance of M. Aerts, the Municipal Gas Engineer, that the Communal Council were induced to come to the assistance of the Association by voting a sum which constituted a very substantial item in their revenue. Now, however, this is to be withheld. This, in itself, looks bad; but, when it is coupled with the fact that circulars have been issued requesting the exhibitors to remove their goods with the least possible delay, the situation becomes serious. As already remarked, there have been for a considerable time dissensions among the members of the Executive Committee with regard to the appliances on view; and it was out of the question to suppose that the Municipal Authorities would remain indifferent to this condition of things. They could not see their way to continuing to furnish a considerable proportion of the means of keeping the concern going; and consequently they intend stopping the supplies as from next October. Of course, the exhibition ought really to remain open till that date; but the Association seem to have preferred to hurry on its closing, in order that the money which will come from the Municipality up to the time named by them for discontinuing their contribution, may go into the general funds. The closing of this exhibition has, it seems, afforded the members of the Committee another opportunity for a display of their antagonism to each other. Several makers of gas appliances and certain managers of works, who regretted an event that would deprive them of an advertisement which proved very useful in their business, speculated on the chances of a resuscitation of the exhibition on strictly commercial lines. A proposal was made to continue it as before at the old place; but, instead of admitting the goods of any manufacturer who chose to send, to make a judicious selection, so as to gradually restrict the exhibits to the productions of certain of the best houses, for whom an excellent agency would thus be constituted—the expenses to be borne by the respective parties. A scheme was elaborated on this basis, and all that remained was to put it into practice, when the ill-humour of one of the members of the present Committee very nearly compromised everything. This worthy gentleman, fearing apparently that in the new combination he would have a powerful competitor with his own establishment, situated in one of the suburbs of the city, ordered the immediate closing of the exhibition, and the no less prompt disposition of its component elements. According to him, this was the most efficacious way of putting an end to this old institution, on which he bestowed all his care and attention when it represented so advantageously the interests of one particular maker, and him a foreigner. All ideas of reconstruction were opposed, as well as other projects which seemed to present any prospect of being inimical to his personal interests. Contrary to precedent, however, the opinion of this gentlemen did not for once prevail. His orders were disregarded by the Manager of the exhibition, who submitted the matter to the other members of the Committee. They decided that the exhibition should remain open, and that no change should be made in the present condition of things until the return of the Directors of the lighting service of Brussels. This delay will give the projectors of the scheme time to prepare to carry it into effect. As they will endeavour to bring influence to bear on parties in high places, if the proposal has been put forward in a practical spirit, and is really a *desideratum*, as it is made out to be, there should be no doubt as to the future success of the undertaking.

High-power lamps have become of quite general use in Belgium, and especially in Brussels. People who are interested in lighting matters frequently ask what is the difference between the several kinds of lamps of this type, all of which are pretty nearly alike as far as outward appearance is concerned. The point on which there is dissimilarity is that of price. There are a good number of inferior workmen in Brussels; and, as a consequence, trade is ruined. Some makers turn out lamps at any price, whether or not they are recuperative ones. The customer, tempted by the bait of an extraordinary bargain, pays, in the shape of gas consumed, in many cases a hundred times more than the amount originally saved on the purchase. This is equally the case with the cheap lamps, which are preferred for letting out on hire, for the lenders have not only to reimburse themselves for the original outlay on the appliances rendered useless, but also to pay the interest on the capital employed in the operation. Among the many lamps put upon the market, only a few—the Wenham among others—continue to be fairly well represented. This system, as well as the Gaso-Multiplex, has been preferred in cases where ventilation in combination with lighting was desired. An example of the application of the latter system was to be found at the exhibition on the Boulevard du Nord alluded to in the previous paragraph; and a system of ventilation by means of the same type of lamp has been carried out at the new quarters of the Chasseurs Eclaireurs. Here the lamps are entirely independent one of the other, and get rid of their products of combustion by means of special flues; whereas at the former place they are connected with one flue ending in the chimney. It may be remembered that a description of this installation was given in the JOURNAL for Oct. 6 last year. It differs from the other in the method by which the lamps are connected with the flue. In the former case, the products were carried off laterally; the lamp-chimney terminating in a vent-hole in the interior of the flue; while in the latter, draught is produced by the direct mixture of the products of combustion and the vitiated air, by making the end of the chimney come close to the lower part of a receiver in which the mixture is effected, and which communicates with the discharge-flue. In order to prevent any back current caused by the wind, the flue is turned upwards where it enters the chimney, and is capped with a smoke-plate. Both systems have furnished conclusive results as far as the steadiness of the flame is concerned. But the plan in which there is a previous mixture of gas and vitiated air is that which gives the best duty.

The radiation of heat from high-power lamps is, as is generally known, a rather serious inconvenience. An engineer who is known for his labours in the field of lighting, and who is the manager of large works laid out for the production of appliances connected therewith, is of opinion—and it would seem justly—that if, instead of metal, one could employ non-conducting materials, or cover with these substances the metallic portions of the lamps which are deemed to be indispensable, considerable progress would be made towards improvement. He believes he has discovered a practical method of solving this problem. It consists in incorporating with the metal, previously made red hot, refractory or non-conducting material in a finely powdered condition; applying it by means of a pulverizer in proportion as the metal cools. In addition to this, the surfaces thus transformed, are passed between the cylinders of a rolling-mill every time it is required to make sheets of metal non-conductive of heat. The method appears likely to have some success for various industrial applications.

THE BOARD OF TRADE AND ELECTRICITY METERS.

Sir Courtenay Boyle, on behalf of the Board of Trade, has addressed the following letter to the Clerk to the London County Council (Mr. H. De la Hooke) on the subject of meters for use in the supply of electricity:—

With reference to previous correspondence on the subject of the approval by this Department of the pattern and construction of electricity meters for the purposes of Electric Lighting Orders, I am directed by the Board of Trade to inform you that, having carefully considered the several patterns of meters which have been submitted for their approval, they are of opinion that it is desirable that they should have further experience of the practical working of the meters in actual use before any formal approval is given. Though some of the patterns of meters which have been submitted have many merits, and the laboratory tests which have been applied have been in several particulars satisfactory, no meter has shown such perfection in principle, design, and construction as to justify the Board of Trade in the conclusion that serious defects might not appear in actual working. Under these circumstances, the Board of Trade are of opinion that further experience of the behaviour of meters should be gained, and possibly further inquiry made, before the final decision of the Department is arrived at. Representations, moreover, have been made to them with regard to the effect on the interests, both of those who are engaged in supplying electrical energy and of those whose efforts are being continuously directed to the invention of meters, which would be produced were any approval, even of a temporary and provisional kind, to be given now to any particular pattern or patterns of meter. With the view of acquiring, as fully and as thoroughly as possible, information as to the behaviour of meters under working conditions, the Board of Trade would be glad of the co-operation of the London County Council in providing for a thorough practical test; and they would suggest that the Council should, at their earliest convenience, instruct their representative to confer with Major Cardew, the electrical adviser of the Department. Pending the acquisition of this information, which they anticipate will occupy a period of about twelve months, the Board of Trade are not prepared either to approve the pattern and construction of any electricity meter not yet approved, or to further extend the approval already given in the case of the Shallenberger meter, which has been approved for the purposes of the following Act and Orders only—viz., The Metropolitan Electric Lighting Act, 1889; the Metropolitan Electric Supply Company (West London) Lighting Order, 1889; the Metropolitan Electric Supply Company (Mid-London) Lighting Order, 1889; the Metropolitan Electric Supply Company (Paddington) Lighting Order, 1890; the House-to-House Electric Light Supply Order, 1889.

Fraudulent Consumption of Gas.—At the Leigh Police Court a few days ago, Mr. J. Pendlebury, a dentist at Atherton, was fined £5 and costs for fraudulently consuming the gas of the Leigh Local Board. The theft of the gas was effected in the well-known way, by means of an india-rubber tube forming a connection between the inlet-pipe to the meter and the service-pipe.

Charters Towers (Queensland) Gas Company, Limited.—We have received a copy of the tenth half-yearly report of the Directors of this Company, covering the six months to April 30 last. They state therein that the consumption of gas is steadily increasing; the total for the half year being 3,895,000 cubic feet—a rise of 734,900 cubic feet, as compared with the corresponding period of 1890-91. The plant has been improved and extended; and good working is looked for in the current six months. The carrying out of these renewals absorbed all the profits; but the Directors confidently expect to re-commence paying dividends at the end of the next half year.

Proposed Purchase of the Local Water and Electric Lighting Works by the Chatham Corporation.—At the meeting of the Chatham Town Council last Wednesday week, a motion was passed, appointing a Committee to consider and report as to the acquisition of the Brompton, Chatham, Gillingham, and Rochester Water Company's works, and the property of the Chatham Electric Lighting Company. The Mayor did not make any extensive explanation, but pointed out that, at the outside, the water-works would not cost a quarter of a million. If they borrowed this at 3½ per cent., and paid it back in 60 years, they would be able to repay capital and interest, and still have left £500 per year on the profits of the Company.

THE METROPOLITAN WATER SUPPLY COMMISSION.

Wednesday, July 27.

(*Lord* BALFOUR OF BURLEIGH, *Chairman; Sir* G. B. BRUCE, *Sir* A. GEIKIE, F.R.S., *Professor* DEWAR, F.R.S., *Mr.* G. H. HILL, M.Inst.C.E., *Mr.* J. MANSERGH, M.Inst.C.E., *and Dr.* W. OGLE, *Commissioners.*)

At the opening of to-day's proceedings,

Mr. *A. C. Waters*, of the Statistical Branch of the Registrar-General's Department, was called to put in and explain tables of population, death-rate, &c., in towns and districts in which the Commission are concerned; one of the tables submitted, giving the deaths per million of the population of London, grouped according to the sources of the water supplies.

Dr. OGLE asked the witness to take it that enteric fever was capable of being diffused by water, and that measles, scarlet fever, diphtheria, and whooping-cough were not; and then, assuming this to be true, to say whether, from the statistical point of view, there was any reason to believe that the consumption of one water supply was the cause of a higher rate of enteric fever in the district of that supply than in other districts.

Witness did not think they could come to any conclusion on the matter.

Another table related to the future population of Greater London; and witness was asked to explain this.

Witness stated that Greater London was the area covered by the Metropolitan and City Police; and it included all parishes within 15 miles of Charing Cross, and also all parishes of which any part was within 12 miles of Charing Cross, even though another part was beyond 15 miles. The area of this was about 700 square miles; and it was practically equal to a circle with a 15-mile radius and Charing Cross as the centre. The population of that area, at successive periods, was: In 1861, 3,232,720; in 1871, 3,885,641; in 1881, 4,766,661; in 1891, 5,633,332. The rates of increase in these decennial periods were: In 1861-71, 20·6 per cent.; in 1871-81, 22·7 per cent.; in 1881-91, 18·2 per cent. In the whole period from 1861 to 1891, the rate of increase was about 74·8 per cent.; in the last 20 years, it was 45 per cent.; and, in the last 10 years, as already mentioned, 18·2 per cent. The rate of increase in the last decennium was lower than it was in the next preceding one. He had also in the tables recorded the results of four separate calculations as to the future population of Greater London. The first one was based upon the hypothesis that the rate of increase in the future would be the same as in the last 30 years; the second, that it would be as in the last 20 years; the third, that it would be as in the last 10 years; and the fourth, on what the population would be if the rate of growth continued to diminish in the same proportion as it did in the last decennium as compared with the preceding one.

The CHAIRMAN: These are not estimates, but absolute statements of what will be the case if those successive hypotheses are accepted?

Witness: They do not represent opinions, but what will be the case on the hypotheses. There is no forecast of probability.

Then, without going into detail, taking 30 years from the last census —that is 1921—what will the population be by these methods?—By the first, it will be 9,893,032; by the second, 9,879,819; by the third, 9,337,542; and on the hypothesis of a continuous decrease in the rate of growth, 7,915,895.

The CHAIRMAN next directed the attention of the witness to a table prepared by him of the population of the Thames catchment basin and its tributaries; and he asked him to point out what the population above Molesey was in 1891.

Witness said it was 1,056,415; and that of the Thames Valley, from that point down to its mouth, 5,917,977. The population of the entire Thames basin, from the sources of all its tributaries down to its mouth, 6,973,992.

Then one table reduces these figures to rates of increase based on the figures, and it shows that the Thames above the intake has increased, in the course of the last 30 years, by 29·3 per cent. The next two tables refer to the Lea basin. What is the population, according to that, of the Lea basin above the New River intake?—In 1891 it was 9442. That includes all parts lying geographically above the intake.

What is the total population of the Lea Valley above the East London Company's intake?—189,287.

And the total population of the whole Lea Valley, with the exception of London?—701,967.

The next table to that shows the rates of increase as based upon those figures. What has been the rate of increase in 30 years, above the New River Company's intake?—23·6 per cent.; and 33·2 per cent. above the East London Company's.

Asked if it would be possible to calculate the probable future population of the Lea catchment basin as had been done in the case of the Thames, witness said he should like to know on what hypothesis that should be done—whether the increase was to be assumed to be the same as in the last 10, 20, or 30 years.

The CHAIRMAN observed that he would have the facts to go upon given in one of the tables. In 1861-71, the increase of population per cent. was 30; in the next ten years, 1871-81, 50·5; and in 1881-91, 51·4; while for the 30 years 1861-91 it was 196·2.

Witness remarked that as the increase had been so enormous in 30 years, it was unlikely that it would be so great in the next 20 or 30 years. Some of the area was filled up; and as it filled, of course the rate of increase must become less.

While the increase was rapid from 1861 to 1871—30 per cent.—it was much more so from 1871 to 1881; but the same relative rate has not been maintained in the last ten years as from 1871 to 1881. Would that go any distance to show that the rapid rate of increase had reached its maximum, and that we might look for something less in the next ten years?—Yes; I think so. You will see that parts of the Lea Valley above the intakes increased by much smaller proportions than was the case in the entire Valley, caused by the filling-up of such places as Tottenham and Edmonton.

And, of course, the Lea Valley being relatively a smaller area would account for the much more rapid increase there than in the Thames Valley?—There has been a more rapid increase in the Lea Valley than in the Thames Valley, because the greater part, like Tottenham and Edmonton, has been almost filled up.

It would be an entirely fallacious method of calculation to apply the same rate of increase in future to the Thames basin and the Lea—the same relative rate?—Yes; I should think so.

As a matter of fact, the entire Thames basin has increased relatively by a less percentage in the last ten years than in either of the two preceding periods of ten years?—Yes.

Dr. *T. Stevenson*, F.R.S., Lecturer on Chemistry at Guy's Hospital, and Scientific Analyst to the Home Office, said he was one of the Royal Commissioners who inquired into the question of the disposal of the sewage of the Metropolis; and during the last ten years he had been consulted by the Corporation of Hertford as to their system of sewage purification. He produced analyses of the effluents taken from the sewage works in 1883, 1884, 1885, and 1886—those taken in 1884 and 1885 being made in respect to the trial of the action between the Lea Conservancy and the Hertford Corporation; and in November, 1891, and April, 1892, he re-examined the effluent, analyses of which he also produced. The process adopted was that of precipitation. After passing the tanks, the liquid matter went through a filter-bed of coke, and then through an open conduit three-quarters of a mile long before it reached the Mainfold ditch; and in about another half mile it communicated with the Lea.

The CHAIRMAN: Have you any knowledge as to the proportions of sulphate of alumina and iron used in the chemical treatment?

Witness said the manager of the works, who was present, would give the proportions; but it was about the usual amount of 3 to 5 grains of sulphate of alumina, 1 grain of sulphate of iron, and (say) 12 grains of lime to the gallon. It varied from time to time; but the manager was a very experienced man, and knew when to add a little more and when to put in a little less. The peculiarity of the effluent was its high dilution, which was brought about by the infiltration of the subsoil water into the drains. It must be so from the enormous sewage per head of the population—amounting to 200 or 300 gallons per day. Asked if it was his opinion, as regards the efficiency of the precipitation process, that it was an advantage to have a highly-diluted sewage to begin with, witness said not absolutely. He thought that if the quantity of sewage were diminished, and then precipitated, the effluent would not be absolutely so good; but if it were then put into the subsoil water separately, it would be better. He would prefer to deal with rather more concentrated sewage, and then dilute it. It was much more costly, too, to deal with highly-diluted sewage. With regard to the analyses of the mud in the Mainfold ditch, complaint was made that there was a black, foul-smelling mud at the bottom. That it was black was undoubted. He wished to ascertain the cause of the blackness, so as to see whether it was due to solid matter from the sewage, or to the chemical action of the iron on the soil; and he found that the mud was practically the same as the surrounding subsoil. The blackness was merely due to the fact of the presence of sulphide of iron, which had probably resulted from the decomposition of some sewage fungus, or from the sewage itself. He found that the surrounding soil was somewhat peaty, and yielded traces of sulphides—possibly sulphide of iron also. It evaporated sulphuretted hydrogen when treated with acids. The soil which he took from the Mainfold ditch was free from smell. He stirred up the mud sometimes, to observe whether or not it did smell. It evolved a great deal of carburetted hydrogen; but there were no offensive gases, and the water above was fairly clear. He had met with sewage fungus in the ditch. Asked if it had been his experience that, unless he had a fairly high percentage of sewage, this fungus was ever met with, witness said it must be in some proportion, but he would not say high. It was not confined to sewage, but other waters containing sulphur compounds—sulphuretted hydrogen—would cause the same fungus to grow. He had never met with it in any watercourse in England that was not contaminated with sewage, because he knew of none containing sulphuretted hydrogen. He only knew the sulphur wells.

The CHAIRMAN: Is it not the fact that the sulphuretted hydrogen is often produced simply by the decay of this fungus—not in the water initially that supplies its life, but owing to its own decomposition?

Witness: It may be so; but it is stated, I think on good scientific authority, that it grows in water organically pure which contains sulphur compounds, though I have no knowledge of it in this country. Here they generally find it in connection with contaminated streams. When the fungus decays, it certainly produces sulphuretted hydrogen, and increases this form of pollution, except that there may be something in the water which restrains it—the iron, for instance.

It is your opinion that there is sufficient iron left in, after the treatment of the Hertford sewage, to prevent the creation of sulphuretted hydrogen?—That is so. I have only once failed to detect the presence of dissolved iron in the water. The organic matter in the sewage keeps a small quantity of iron in solution. The chief use of filtration through coke is in keeping back suspended matter. The only possible danger to the water supply of London attendant upon the admission of the Hertford effluent is the introduction of specific or pathogenic organisms—a possible danger attendant upon the admission of any form of sewage into a river from which water is taken for drinking purposes.

Do I understand you to express the opinion that, whether you use a precipitation process or a precipitation process combined with land, or a land process alone, they are all equally defective as regards the specific point you are dealing with?—No; not equally.

Will you tell me what is your opinion as to the most efficient mode of treating sewage, having regard to that special point?—I think the most effective mode would be to precipitate, and then to filter through land; but in Hertford there is great difficulty in the way of land treatment. There is no evidence that, with a run of 15 miles down to the intake of the Water Company, the pathogenic organisms of typhoid fever will survive.

Your view is that, having regard to the special case of Hertford, the chemical precipitation process is sufficiently satisfactory, on the ground that there is such a long run in the river before it comes to the intake

of the East London Water Company?—Yes, after the careful treatment and exposure. I apprehend no danger to the filtered London water, for, of course, I should not think of London taking unfiltered water from the Lea.

In answer to further questions, witness said there were very great engineering difficulties in the way of filtering the Hertford sewage through land; and there was also the fact that the deep wells of the New River Company or the Chadwell Spring and the New River Head were down in the neighbourhood of the cut; and if the sewage were distributed over the land into which the Company had sunk their wells, they would strongly object.

Mr. *C. E. Longmore*, Town Clerk of Hertford, gave evidence as to the population of the town, and to the proceedings which had taken place before Mr. Justice Watkin Williams between the Lea Conservancy and the Hertford Corporation; that learned Judge deciding that the drinking water was not drawn from the Lea within any distance that could possibly be affected by the effluent from the sewage works. He (witness) did not think the description Major Lamorock Flower had given to the Commission, as to the effluent being black, filthy, and shiny, with a nasty urinous smell, was at all a fair one; and having seen it within the last few weeks, he considered that it looked very well for a sewage effluent. In his opinion they turned an effluent into the river which did not cause nuisance in any way to those who lived below it; and if the Water Companies desired the effluent brought up to the standard of drinking water, it should be at their expense, and not at that of the inhabitants of Hertford. He did not think they ought to be rated to keep up the river to the standard of drinking water for the inhabitants of London.

In reply to Sir A. GEIKIE, witness said that the Hertford authorities considered the question of the engineering difficulties in the way of putting the sewage on land. The New River Company spent a very considerable sum in sewering Hertford; and they would very strongly object to any portion of the land in the neighbourhood having sewage cast upon it.

In answer to the CHAIRMAN, witness said the action of the Lea Conservancy against the Corporation of Hertford was taken under the general law. It was for an injunction; but he did not think the General Act carried them much further than the common law. The Judge held that they were not entitled to commit a nuisance in any way. So long as they were using the best practical process of purification, they were not liable for discharging the effluent into the river; and he held that they were using the best practical process of purification. The Corporation strongly objected to any greater quantity of water being taken by the Water Companies in the Lea Valley; and upon that branch of the case they supported the action of the Hertfordshire County Council.

Questioned by Mr. HILL, witness said the town of Hertford was supplied with water from artesian wells in the chalk. He had heard complaints outside Hertford of the surface springs being affected by the operations of the New River Company; but he was not instructed to put this matter forward on behalf of the Corporation, as they left this part of the case to the County Council.

Dr. *G. Turner*, Medical Officer of Health for Hertford, gave further evidence as to the character of the effluent from the sewage works. He said the dark colour, &c., noted at the outfall was not caused by the effluent, but by the nature of the soil over which the effluent flowed, and the existence of a lock just above the outfall. He agreed with Dr. Stevenson that, provided the sewage of Hertford had not the infiltration of subsoil water, but was treated in the same way as it was now, it would be more efficient as regards purification. The more concentrated they could make the sewage, the more putrescible matter they could get out of it, and the more readily and cheaply it would be done. The black bottom of the ditch referred to was not due to sewage matter, but to the presence of sulphide of iron and some peat. When first he saw the ditch, ten or twelve years ago, he was so impressed with the fact that there was sewage going into it, that he expected he would have to report very strongly upon the matter; but when he took the effluent, it was so free from objection that he thought some trick was being played upon him.

Sir G. B. BRUCE: You believe that the effluent would be better when it passes into the river, if the sewage had not this large dilution of water?

Witness: Yes. There would be about 250,000 gallons of effluent, and this might perhaps have a fraction more organic matter in it compared with the quantity they have now, taking gallon per gallon; but the difference would be very slight, and the improvement in the total quantity very large. I should let the subsoil water run into the ditch, as it does at present, and turn the effluent into it; and I am perfectly sure they would save money by it.

Mr. HILL: That would mean laying down new sewers, of course?

Witness: I should not hesitate to lay down new sewers. I have always said so.

Mr. *U. A. Smith*, Borough Engineer of Hertford, put in statements of the quantities of matter treated at the Hertford sewage works, and of the water that went into the sewers of the place. When the sewers were made, they were so constructed—not intentionally, perhaps—as to admit of a very large quantity of subsoil water, and this amounted generally to something like nine-tenths of the whole of the sewage delivered at the works. There was a further dilution—upwards of a million gallons joining the effluent as it passed down.

Asked by Sir A. GEIKIE if he saw any engineering difficulties in treating the sewage on land, witness said he did not know whether the question of cost was an engineering difficulty; they could do anything if they were supplied with the money.

Mr. *J. Cramp*, Manager of the Hertford sewage-works, submitted some particulars of his treatment of the sewage; but mentioned that he was "no chemist."

At the close of this evidence,

The CHAIRMAN intimated that the Commission would adjourn till the first week in October. There would be no further public sittings till then, as they were led to believe that such would cause great inconvenience to those who were to appear. The next sitting would probably be on Oct. 5; but due intimation would be given of it.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

As reported in your last issue, the annual accounts of the Glasgow Gas Trust came before the Town Council at their meeting on the previous Thursday, and were approved without dissent—a circumstance which speak volumes for the business capacity of the Council. The Gas Committee had an unpleasant duty to perform; and it is pleasing to observe that, in the doing of it, they were not in any way hampered by the carping criticism of their colleagues. Had the same situation occurred in Edinburgh, someone who had a pet notion (most probably founded upon nothing except his own ignorance) would have been certain to have interposed with his particular fad, to the annoyance of those who had the work in hand, and to the prejudice of the Gas Committee in the eyes of the public. Better discipline prevails in Glasgow, the reason for which, I take it, is that those who are in authority will not brook any interference in public. Why should they? If a private member wishes information, or desires to impress a certain view upon his colleagues, the place to do it is in Committee, where he can be put right if he is wrong. But when they come before the public, each man should come prepared to support the powers that be. Of course, when a vital question arises, opposition may be tolerated; but continual carping is to be deprecated. This doctrine assumes that the body has a policy, and that the leaders are following that policy. Otherwise the most determined opposition possible is, on all grounds, justified. It also assumes that the man who is expounding the policy of the body conceals nothing. That this was fully done by Bailie Mitchell, I am not prepared to affirm. I think that the work of the Glasgow Gas Trust for a twelvemonth would have stood a little more explanation than is given to the public. It is true that Bailie Mitchell had not such a free hand in the way of comparison as presented itself in former years, because of the taking in of the new works. This will right itself by next year, and then it is to be hoped the Convener will be able, under better circumstances, to give a fuller explanation.

While the above is true generally of the Glasgow Town Council, it is not to be expected that such a large body should be altogether free from the presence of men with a few notions which do not "square" with the general current. Such a one is to be found in Mr. Pirrie, who, at the meeting above referred to, took exception to the work which was done on Sundays at the new gasholder at the Temple Gas-Works. The breaking of the Sabbath was not so much the complaint of those who objected to the work, being carried on on Sunday, as the fact that it helped to enable the contractor to earn his premium for the early completion of the job. However, the explanation that it was necessary to push on the work, so as to avoid the sides of the excavation falling in and the accumulation of water, was sufficient; and the little incident was allowed to drop after a sort of protest which was not very strong.

At the meeting of the Greenock Police Board last Tuesday, a report was submitted from a Special Committee on the balance-sheet of the Gas Trust laid before them at last month's meeting, referred to in my "Notes" on the 26th ult. Among other things, the report stated that the Committee had made careful inquiry into the causes of the difference between the actual result of last year's workings over that of the estimates for the same period. In the first place, the estimate was based on an anticipated make of gas of 214 million cubic feet for the year, whereas there has been an actual production of 230 million cubic feet, equal to 7½ per cent. over the estimate, and about 9 per cent. over the year 1891. The difference was made up by the anticipated surplus mentioned in the estimate, £840, and the deficit upon the actual workings, as shown in the present balance-sheet, £1033—together, £1873. So far as the revenue is concerned, the Committee find that the additional production of gas has not been fully realized, as upon the year's operations the unaccounted-for gas has increased by 1¾ per cent. over the preceding year. The loss thus sustained stands at 10·98 per cent. on a make of gas of 230 millions, against 9·49 per cent. on a make of gas of 210 millions, and is equal to about £875. The return under the head of residual products has been affected by an unexpected and sharp decline in the market value of these products, which has been felt by gas-works generally, and by which there has been a diminished revenue of £993. For the first time the rental from gas-stoves has been transferred from the revenue to the capital account, in the form of a depreciation, amounting to £80. These three sums made together £1948. In the course of some general remarks, the Committee stated that the position of Greenock in relation to its gas account was not exceptional at the present time, as the finances of many gas undertakings had suffered more or less severely from the same disturbing influences as had been in operation in Greenock—viz., a large increase in the price of coal, and an unforeseen and almost unprecedented decline in the market value of residuals. The Committee reported that the current year's contracts for coal had been arranged at prices somewhat lower than those of the year just ended; but the market for residual products was uncertain, and showed no immediate sign of improvement. They recommended that trial balances, after the collection periods of November and January, should be made; and that the particulars relating to the manufacture and sale of residual products should be reported to the Gas Committee at each monthly meeting while these works are in operation. Bailie Erskine, Convener of the Gas Committee, in moving the adoption of the report, stated that the last deficit was in 1873, when the rate was 4s. 6d. It was then raised to 5s., and continued at that figure until 1876. In these years the profits amounted to £2000 each year. A reduction was made to 4s. 7d., and up till 1879 the profits were £4000 a year. A further reduction was made in 1880, to 4s. 2d.; and in 1880 and 1881 the profits were again £4000. In 1882 they reached the highest figure ever attained—£7204. The rate was then reduced to 3s. 9d., and kept at this until 1888. In 1883 the profits were £5637; in 1884, £3980; in 1885, £876; in 1886 and 1887, £2500 each. A reduction to 3s. 6½d. was made in the latter year; and in 1889 the profits were £2345, when a reduction was made to 3s. 4d., the present rate. In 1890 the profits were £3456; in 1891, £2041; and in 1892 there was a deficit of £1033, though there

had been an estimated profit of £840. The Police Board seemed to think they were entitled to profit, because, although there was none made, they seized the money all the same. The Provost pointed out that, according to a statement prepared by the Manager (Mr. S. Stewart), with the exception of Glasgow, Greenock paid less for coal, and obtained more for residual products, than any other large town in Scotland. It was, therefore, not the fault of the officials that there had been a deficit; all of them having done their work thoroughly. Mr. Watson said that, notwithstanding the report, the broad fact remained that the great source of weakness and loss had been the provision of additional storeage for gas. Mr. A. J. Black expressed the opinion that there should be trial balances once a month, Bailie Anderson did not agree with Mr. Watson. The new gasholder was provided, he said, because nobody knew how soon one of the old ones might fail. Bailie Erskine remarked that it was absolutely impossible for a large undertaking like the gas-works to present a monthly report. The minutes were adopted.

The offer of the British Electric Lighting Company for the supply of dynamos and arc lamps to the Glasgow Corporation, in connection with their electric lighting installation, has been accepted. The cost of the former is £1510; and of the latter, £7 13s. 8d. per lamp.

A few weeks ago, the fraternity of gas producers in Scotland were making themselves hilarious over the fact that all the advantages which are derived from gas lighting flowed from the brain of a Scotch mechanician. Exactly the same thing is being attempted with reference to electric lighting. I know nothing of the merits of the case which is being presented; I merely state the fact that the attempt is being made by Dr. Keiller, of Edinburgh. It came out in the Mathematical and Physical Science Section of the British Association on the last day of the Edinburgh meeting, in a paper which Dr. Keiller read. He is 80 years of age, and is now taking matters more easily than he did during the long period in which he conducted a large practice in Edinburgh. This paper was the product of his leisure. He is a native of Dundee, and his theory is that Mr. J. B. Lindsay, who began as a weaver in Dundee, and who remained all his life a poor man, though a learned scientist, was the first to apply electricity to lighting purposes. The first step Mr. Lindsay took in public was in 1836, when he delivered a lecture in Dundee upon the new light he had to show; and he at that time exhibited it experimentally in the lecture-room. Dr. Keiller contended that Lindsay in that lecture predicted the application of electricity to lighting purposes; and he claimed for him that he was the first to set going the great industry which now exists. The story is a very pretty one, and is most flattering to Scotsmen, who have a high faculty for discovering that their countrymen were first in most things. Murdoch is all but universally acknowledged to have been the first to apply coal gas to lighting purposes. It will be very gratifying to Scotch people if Dr. Keiller can establish it that one of themselves was the first electric light man. It is, I understand, the intention of those who hold the same view as Dr. Keiller to originate a movement for the erection of a statue to Lindsay in Dundee, which certainly looks as if there were some ground for putting forth the statement. As far as I am concerned, I merely content myself with giving the story; leaving your readers to do the verification of it for themselves.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 20.

Sulphate of Ammonia.—There is, if anything, a better feeling; and the demand during the week shows some improvement. The tendency on the whole seems for continued steadiness; and the transactions for present and near delivery do not at all events indicate a declining market. Stocks seem smaller than ever before; and there is therefore no telling how soon the market may become affected, should the improvement in the demand continue. The value remains at £9 17s. 6d. Nitrate is unchanged.

LONDON, *Aug.* 20.

Tar Products.—Business in this market was never so bad as it is at the moment. Buyers continue to depress prices; and, the instability of sellers, together with the depression of trade in other directions, all conspire to prevent the prices assuming a reasonable position, since there are no serious stocks of any kind. There is a good deal of inquiry for carbolic acid, cresol, and other tar disinfectants; but, no improvement in price seems obtainable. Tar contracts are being let at from 8s. to 10s., according to position and quality. Pitch is being shipped on old contracts; but for future delivery, it is quotable at 25s. Other prices are nominally as follows: Tar, 8s. to 10s. Pitch, 25s. Benzol, 90's, 1s. 7d.; 50's, 1s. 3d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude benzol naphtha, 30 per cent., 7d. Creosote, 1d. Naphthalene, 20s.; pressed, 40s. Crude carbolic acid, 60's, 1s. 6d.; 70's, 1s. 9d.; crystals, 6½d. Cresols, 1s. 8d. Anthracene, 30 per cent., "A" quality, 9½d.; "B" quality, 6½d.

Sulphate of Ammonia.—The market is flat; and buyers are expecting to see lower prices. The production, however, is seriously short of what it was expected to be; and as stocks are practically *nil*, there is no reason for any reduction in price. Business is reported at £9 15s. to £9 17s. 6d., less 3½ per cent., according to position and terms of delivery. Gas liquor (10-oz.) is quoted at 5s. 6d. to 6s. 6d.

Yarmouth and the Electric Light.—At the last quarterly meeting of the Yarmouth Town Council, the Town Clerk reported that he had received tenders for an electric light installation for the town from several firms. The tenders varied from between £5000 and £6000 to £23,000. Mr. W. H. Preece has been engaged to examine and report upon the tenders and specifications.

Improvements in the Worcester Water Supply.—The Worcester City Council have agreed to a recommendation of the Water Committee that the water supply to the high districts should be improved by acquiring land on Elbury Hills at a cost of £1000 (provided the Local Government Board sanction the loan), and constructing a reservoir to hold 60,000 gallons, at an expenditure of £1961.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business generally throughout the coal trade of Lancashire remains in much the same quiet condition as recently reported—all descriptions of round coal moving off very slowly; and though few of the pits are working more than four days a week, stocks are now accumulating very generally at the collieries. The best descriptions of round coal are maintaining their price very steadily, and do not average less than 12s. per ton for best Wigan Arley, 10s. for good Pemberton four-feet and second qualities of Arley, and 8s. 6d. to 9s. for common house-fire coals; but occasionally special sales are made where buyers can take off extra quantities for prompt delivery at rather low figures. Common round coals still hang upon the market, and are difficult to dispose of, with prices weak where anything like quantities are concerned. For inland sales, at the pit's mouth, prices remain at about 7s. 9d. to 8s. for ordinary descriptions of steam and forge coal. For forward contracts, however, quotations are irregular; and very low figures are frequently taken to move away surplus quantities. Good Lancashire steam coal does not average, according to quality, more than 8s. 6d. to 9s. per ton delivered at the ports on the Mersey, with some of the better qualities, suitable for house-fire purposes, quoted at very little more than the prices current at the pit's mouth. Welsh steam coal continues to be pushed for sale, delivered in waggons at Birkenhead, at very low figures. Engine classes of fuel are in brisk request; and as there is still a scarcity of supplies from the Lancashire collieries, prices are very firm at fully late rates—no difficulty being experienced in maintaining the slight advances which were recently put on. At the pit's mouth, burgy averages 6s. 3d. to 6s. 9d.; best slack, 5s. to 5s. 6d.; medium, 4s. 3d. to 4s. 9d.; and common slack, 3s. 6d. to 4s. per ton.

Northern Coal Trade.—There has been a slight lull in the demand for one or two classes of coal; but the output is still well taken up. Best Northumbrian steam coals are quiet at about 10s. 6d. per ton, free on board; but the best collieries have rather less work, and in one or two instances a slightly lower price has been taken to allow full work to be maintained. Small steam coals are very plentiful; and there is an ease in prices—about 4s. to 4s. 3d. now ruling. In gas coals, interest has centred rather in contracts than in current sales. For odd cargoes, from 8s. 6d. to 9s. per ton, free on board, is still the quoted price; but the contracts that have been taken are usually at slightly below 8s. per ton. At prices such as these, very heavy commitments have been made, both for distant and for local gas-works. Generally speaking, the rates are lower than those which have ruled for the past contracts; and thus the gas companies will derive relief when the new ones begin. Bunker coals are very low in price, and the supply is abundant; so that the tendency seems towards a further weakness. Manufacturing as well as household coals are dull. Best Durham blast-furnace coke sells freely at the price of 13s. to 13s. 6d. delivered at furnaces in the South Durham and Cleveland district.

The Proposed Purchase of the Maidstone Water-Works by the Local Board.—The Maidstone Local Board last Wednesday resolved to promote a Bill in the next session of Parliament for the compulsory sale to them of the property of the Water Company.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have opened offices at No. 15, Victoria Street, Westminster, S.W., so as to permit of their communicating conveniently with their friends in London and the South of England. Mr. C. J. Brown will manage their London office, and be their representative.

Gas Exhibitions and Cookery Lectures.—From Tuesday to Friday last week, an exhibition of gas appliances was held by Messrs. W. Parkinson and Co. in the Wesleyan Hall, Coventry Road, Birmingham; Miss Thwaites, of Liverpool, giving twice on each day practical lessons in cookery. During the past fortnight, Messrs. Richmond and Co., Limited, have held very successful exhibitions at Wolverhampton, Brighton, and Plymouth. At the two first-named places Mr. E. W. T. Richmond delivered his now well-known lecture on "Gas as a Domestic Servant;" and cookery lessons were given at Brighton by Miss Leng, and at Plymouth by Miss Golding. Last week Mrs. H. M. Young gave a course of practical demonstrations and lectures on cookery in the Court Room of the Town Buildings, Montrose; employing for the purpose one of Messrs. Fletcher, Russell, and Co.'s stoves. Mr. W. J. Young, M.P.S., lectured on Tuesday on invalid cookery. One of the most interesting of the above-named lady's lectures was that in which she cooked a dinner, comprising five courses, in an hour. This was most satisfactorily done, with an expenditure of gas, as shown by the meter connected with the stove (the registration of which was taken by Mr. T. Douglas Hall, Manager of the Gas Company), to have been only 25 cubic feet, costing 1¼d.

Defalcations by a Collector of the Kendal Gas and Water Company.—At the Kendal Police Court last Friday, Marcellus Thompson, who for many years has filled the office of collector to the Kendal Gas and Water Company, was charged with embezzling £13 6s. 1d., £12 2s. 1d., and £7 2s. 1d., the moneys of the Company, and further, with unlawfully and wilfully omitting material particulars from a certain book belonging to them. From the evidence of the Chairman (Mr. W. D. Crewdson) and others, it appeared that prisoner had been over twenty years in the Company's employ, and that no suspicion rested on him until Aug. 8. At an interview the prisoner said: "I took the money; and it is not more than £1000." The amount of defalcations were stated to be close upon £4000. For the defence, Mr. R. F. Thompson pleaded guilty for his client, and asked the Bench to deal summarily with him under the First Offenders Act. The friends of the prisoner possessed property at Grange, Grasmere, and Kendal; and he was instructed to state on their behalf that they would dispose of all they possessed to meet the losses of the Company. They had already paid £250 towards this end. The Bench committed prisoner for trial at the Quarter Sessions. The defalcations were referred to at the meeting of the Company, the proceedings at which are noticed in this issue, under the heading of Provincial Gas Companies.

The Schulke Lamp Company, Limited, has been registered with a capital of £6000, in 5850 shares of £1 each and 3000 shares of 1s. each, to acquire the business of the Schulke Gas-Lamp Company, Limited, in accordance with an agreement made between A. Heindorf and the Company.

The Leeds Gas Coal Contracts.—The Gas Committee of the Leeds Corporation met last Thursday, and spent a considerable time in discussing the tenders for the supply of coal to the gas-works for the nine months ending June, 1893. The prices showed a reduction upon last year, varying from 9d. to 1s. 9d. a ton less than twelve months ago.

Lothammer New Gas Company, Limited.—A Company under this title, with a capital of £10,000, in £1 shares, has just been registered, to "carry into effect an agreement, expressed to be made between W. E. Batiste and A. Rousselle of the one part and the Company of the other part, for the acquisition of certain letters patent relating to an improved portable apparatus for the manufacture of gas, and to develop and work the same."

Electric Lighting at Cardiff.—The Corporation of Cardiff have, on the recommendation of the Lighting Committee, and by the unanimous vote of the Council, decided to exercise the electric lighting powers contained in their Provisional Order; and works are to be started at once for supplying current on the moderate high-tension system within the compulsory area of the town. A complete plan has been prepared by Mr. W. H. Massey; and, acting on his advice, the scheme will be carried out by the Borough Engineer and his staff.

New Water-Works for Fenny Stratford.—Water-works for the supply of the districts of Fenny Stratford and Bletchley were opened on the 11th inst. by the Chairman of the Newport Pagnell Board of Guardians. The supply is obtained from the greensand at Great Brickhill, and is pumped by a pair of 7-horse power Hornsby-Ackroyd oil-engines to a reservoir at an elevation of 532 feet above Ordnance datum, from which it is distributed through about 10 miles of mains. The pressures at the various points were tested and found to be highly satisfactory. The works have been designed and carried out by Mr. John Eunson, Assoc.M.Inst.C.E., of Northampton, for the Board of Guardians. The provision of the new supply has given great satisfaction to the inhabitants of the district, which of late has been exceptionally short of water.

The Leeds Gas Stokers and the Gas Workers' Union.—At a meeting of the Gas Committee of the Leeds Corporation last Thursday, a complaint was made regarding the action of the stokers employed at the Meadow Lane Gas-Works. The Manager (Mr. Tooley) reported that the whole of the stokers engaged at the station went to work on Tuesday morning at the usual time, but declined to begin operations until one of their number had been discharged for refusing to pay his contribution to the Union. He informed them that this was no business of his; that the matter must be settled among themselves; and that, if they wished to desist from work, they must give the usual month's notice. The men told him that Mr. Cockayne their Secretary, was waiting at the gates to explain matters; but he replied that it was not a matter in which explanation was needed, but simply a question of management. After waiting a quarter-of-an-hour, the men evidently thought better of the matter and proceeded to work. The Gas Committee approved of Mr. Tooley's action.

Trade Items!—We learn that Messrs. S. Cutler and Sons have been entrusted with large extensions of the condensing and scrubbing plant at the Dublin Gas-Works. The condensers will be of the Morris and Cutler type, capable of dealing with 3 million cubic feet of gas per diem; and the scrubbers of similar capacity, constructed on Cutler's patent "combination" principle. We understand that upwards of 70 gas-works are now using this apparatus, which has been adopted this summer at Belfast, Colchester, Harrogate, Manchester (third set), Smethwick, Brazil, and Hong-Kong.——Messrs. Brotherton and Co., of Leeds, have secured the Birmingham contract for ammoniacal liquor for ten years. It is probably the largest ever made, taking into account the term and the magnitude of the production, which is expected to be that of fully 5 million tons of coal.——The Lords of the Admiralty have again awarded the United Asbestos Company, Limited, the contract for the supply of all asbestos goods required in the Royal Navy during the ensuing twelve months.

Richmond (Surrey) Water Supply and Drainage.—The Local Authority of Richmond are much troubled about the water supply of the town. The works were started 16 years ago, when it was hoped they would be carried out for £28,000, and water supplied at a rate of 6d. in the pound; but the town is still without an adequate independent service, although more than £80,000 have been borrowed for the purpose, and the rate last year was at 1s. 4d. in the pound. Out of the total sum borrowed, upwards of £50,000 remains unpaid, and the town is still dependent for part of its supply upon the Southwark and Vauxhall Water Company. The Water Committee of the Corporation have come almost to the end of their resources. The Main Sewerage Board also are just now placed in a position of great difficulty. Their system has only recently been completed at a cost of upwards of £100,000. The "destructor" system is employed, whereby the sewage gas passes up an iron pillar, usually a gas-lamp pillar, and is consumed by gas at the foot. But it has been found that the draught is frequently sufficient to put out the lighted gas, which thus escapes into the upper air; and, fearing that an explosion may occur, the Richmond Gas Company have given notice of refusal any longer to supply gas to the destructors. This notice comes at a time when, yielding to the public feeling that the manholes should be closed, owing to the offensive smell emitted from them, the Main Sewerage Board have closed a large number of openings, and are about to close the remainder. There will then be no ventilation at all unless the sewer gas forces its way up the drains into the houses, which would constitute the gravest danger to the public health. Alternative schemes have been proposed, such as ventilation up the sides of the houses, the use of furnaces or fans, or shafts placed in suitable positions. The first of these systems had previously been in use to a small extent; but it will be necessary, if it is again adopted, to obtain the co-operation of a larger number of householders than before.

The Cost of the Treatment of London Sewage.—At the last meeting of the London County Council before the recess, the Chairman (Mr. J. Hutton) delivered an address in which he reviewed the work of the Council in the past year. Referring to the subject of the treatment of London sewage, he said that several additional sludge vessels had been ordered during the past year; and the amount of sludge taken out to sea had assumed proportions which, after the next winter floods, in the opinion of those competent to judge, would testify to the improved condition of the river. The sewage of London could not be deodorized for nothing; and the cost of the chemicals used in the process last year amounted to £27,525. The rickety and antiquated gear of the pumping-stations had been superseded by new plant; and the whole system put into a smart and capable condition, worthy of the magnitude of the interests involved. Proof that efficiency meant economy was given in the fact that at the Abbey Mills station, for the pumping of practically the same quantity of sewage, a saving of 2000 tons of coal had been effected in the past year's work by reason of the perfection of the pumps and other working gear.

Southport and the Electric Light.—Last Tuesday, a special meeting of the Southport Town Council was held, for the purpose of considering the recommendations of the Gas Committee with regard to the adoption of an electric lighting system by the Corporation. Estimates showing a proposed capital outlay of £27,060 on the scheme were submitted. This is to cover the cost of buildings and distribution mains sufficient for 6600 16-candle power incandescent lamps, or 12,000 lamps of 10-candle power, and for the generating plant for the supply of 1900 16-candle power incandescent lamps, or 3700 lamps of 10-candle power. The Committee recommended the adoption of the estimates. Alderman Hacking, the Chairman of the Gas Committee, moved the adoption of the minutes containing the recommendations. He explained that the Council had already resolved to adopt the high tension system, and to place the installation on a site adjoining the gas-works at Crowlands. The scheme they now recommended embraced two services, one for the supply of electricity to the residential district having Hesketh Park as its centre, and the other to the business section of the town. The recommendation was adopted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 336.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	13 Apr.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	"	7½	Do. 7 p. c.	10	11—12	..	6 5 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	103—105	..	4 15 3
100,000	20	27 May	8	Bahia, Limited	20	10—12	..	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6—6½	..	5 15 9
40,000	5	"	7½	Do. New	4	4—4½	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	210-215*	..	5 13 10
150,000	"	"	9½	Do. New	100	162-167*	..	5 10 9
220,000	20	11 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	11 Mar.	5	Bristol	100	95—100	..	5 0 0
320,000	20	13 Apr.	11½	British	20	41—43	..	5 4 8
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	"	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	"	—	Buenos Ayres (New) Limited	10	6½—7½	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	92—95	..	6 6 4
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27*	..	5 18 6
550,000	Stck.	13 Apr.	13	Commercial, Old Stock	100	233—238	..	5 9 3
165,000	"	"	10	Do. New do.	100	180—185	..	5 8 1
130,000	"	15 June	4½	Do. 4½ p. c. Deb. do.	100	120—125	..	3 12 0
800,000	Stck.	15 June	13	Continental Union, Limited	100	221—225	+1	5 15 6
200,000	"	"	10	Do. 7 p. c. Pref.	100	185—195	..	5 2 7
75,000	Stck.	30 Mar.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	19—20	..	5 0 0
354,060	10	"	10	Do. Partly paid		7½ 14—15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	213-217*	+2	5 10 7
100,000	"	"	4	Do. B, 4 p. c. max.	100	95—98*	..	1 1 7
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	250-255*	..	3 18 5
30,000	"		5	Do. F, 5 p. c. Prf.	100	116-121*	..	4 2 7
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	166-171*	..	4 7 8
1,300,000	"	"	7	Do. H, 7 p. c. max	100	154-159*	..	4 8 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	100	248-253*	..	3 18 11
476,000	"	"	6	Do. K, 6 p. c. Prf.	100	145-150*	..	4 0 0
1,061,150	"	15 June	4	Do. 4 p. c. Deb. Stk.	100	115—117	..	3 8 5
294,850	"	"	4½	Do. 4½ p. c. do.	100	119—123	..	3 13 2
908,000	"	"	6	Do. 6 p. c. do	100	164—169	..	3 11 0
3,800,000	Stck.	12 May	12	Imperial Continental	100	222—226	..	5 6 3
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Apr.	5	Met. of Melbourne, 5p. c. Deb.	100	108—110	..	4 10 11
541,920	20	15 June	5	Monte Video, Limited	20	12½—13½	−1	7 8 2
150,000	5	27 May	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Mar.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2—3	..	—
				People's Gas of Chicago—				
420,000	100	3 May	6	1st Mtg. Bds.	100	106—110	..	5 9 1
500,000	100	1 June	6	2nd Do.	100	100—103	..	5 16 7
150,000	10	15 Oct.	10	San Paulo, Limited	10	8—9	..	—
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	277—282	+4	5 9 11
1,350,000	"	"	12	Do. B do.	100	224—229	+1	5 4 10
200,000	"	"	13	Do. C do.	100	235—245	..	5 6 1
725,000	"	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—144	..	3 9 6
60,000	Stck.	11 Mar.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
743,952	Stck.	1 July	10	Chelsea, Ordinary	100	245—250	..	4 0 0
1,720,252	Stck.	13 Apr.	8	East London, Ordinary	100	193—198	..	4 0 10
544,440	"	1 July	4½	Do. 4½ p. c. Deb. Stk.	100	138—142	..	3 3 4
700,000	50	1 July	8½	Grand Junction	50	100—104	..	4 1 9
708,000	Stck.	12 Aug.	11	Kent	100	258-263*	..	4 3 7
1,043,800	100	1 July	9½	Lambeth, 10 p. c. max.	100	216—221	..	4 5 11
406,200	100	"	7½	Do. 7½ p. c. max.	100	190—194	..	3 17 3
279,700	Stck.	30 Mar.	4	Do. 4 p. c. Deb. Stk.	100	123—128	..	3 2 6
500,000	100	12 Aug.	12½	New River, New Shares	100	320-330*	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	126—129	..	3 2 0
902,300	Stck.	15 June	6½	S'thwk & V'xhall, 10p. c. max.	100	143—148	−2	4 7 10
126,500	100	"	6½	Do. D 7½ p. c. do.	100	134—138	..	4 14 3
1,155,066	Stck.	15 June	10	West Middlesex	100	235—240	−1	4 3 4

*Ex div.

Gas Supply to the Out-Districts of Salford.—Last Thursday a deputation from the Swinton and Pendlebury Local Board, waited upon the Salford Corporation Gas Committee to ascertain what concessions they were willing to make in the matter of the gas supply of Swinton and Pendlebury. After an interview lasting above an hour, the Committee decided to grant the same concession to Swinton that they had given to Eccles—a reduction in the differential rate of 2d. per 1000 cubic feet. The Committee pointed out to the deputation that, considering the enormous difficulties they had had to overcome since they took office, and the previous reductions they had made to the out-districts of Salford, they were of opinion that they had done remarkably well. It has been proposed that a conference be held of representatives from the Eccles and Swinton Local Board to see if joint action cannot be taken to avail themselves of the clause inserted in the Salford Provisional Order, giving these Boards power, either jointly or separately, within two years to manufacture and supply gas to the whole of the out-districts of Salford, excepting Prestwich. The Sub-Gas Committee of the Eccles Local Board are at present obtaining information from their Consulting Gas Engineer (Mr. Corbet Woodall) and other experts with a view of laying it before a meeting of ratepayers, for them to decide whether Eccles shall promote a Bill in the next session of Parliament.

The Wolverhampton Corporation and the Electric Light.—At the ordinary meeting of the Wolverhampton Town Council on the 8th inst., the Mayor (Alderman Saunders) moved a resolution adopting a report by the Lighting Committee on the question of supplying the borough with the electric light (see *ante*, p. 174), and authorizing a Special Committee to advertise for tenders for the construction of the necessary works. In support of the motion, the Mayor remarked that the Council were compelled to take up the subject, or allow a company to be formed to monopolize the supply of electricity in the town—adding that "they had unfortunately seen the effect of the monopoly of the Gas Company; and it was their duty to prevent any other company from exercising similar powers." Alderman Jones seconded the motion. He pointed out that the question was not a new one, for in 1889 a report on electric lighting was presented to the Council, and a Provisional Order was obtained in 1890. This Order they could now take advantage of. It was thought they would be able to supply the light at 8s. 4d. per light per annum; and it should be recollected that the cost of production was rapidly decreasing. There were about 100,000 gas lights in the district; and it was thought advisable to provide at the outset about 10,000 electric lights and 50 arc lights. Each arc light would be of about 1000-candle power, and would replace four gas-lamps in the streets. In two or three years it was expected they would be able to supply the light at 4d. per unit. In replying to questions, Alderman Jones said that the fitting of houses with the electric light would cost about the same as in the case of gas. It was something like £1 a light for gas; and he believed that it would be near this sum for the electric light. The motion was unanimously adopted.

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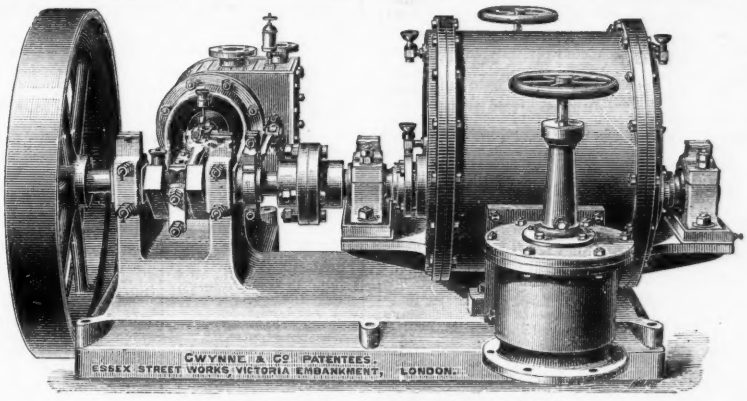

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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, Cathedral Chambers, Hall Street, MANCHESTER.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street London, W.
Lux's Gas Regulators for every consumption.
Lux's single-stem Pressure-Gauges.
Lux's Regulator for Gas-Engines.
Lux's Gas-Balance.
Lux's new Gas Regulator for Inverted Lamps and other Apparatus for Gas Lighting, &c.

ADVERTISER wants employment. Thoroughly understands Gas-Making Machines and Oil-Gas Apparatus on the latest new principles, and ready to make improvements. Also used to making Wet and Dry Meters.
Address G. WATERMAN, 15, Skinner Street, CLERKENWELL, E.C.

ADVERTISER seeks a re-engagement as SECRETARY to a Company, or any similar POSITION OF TRUST. Has had considerable experience in Limited-liability work, Secretarial and otherwise. Can supply the highest references and testimonials.
Address No. 2127, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO SANITARY AND GAS ENGINEERING FIRMS.
WANTED, a position as Manager or UNDER-MANAGER (indoors), with view to small share in the Business. Advertiser has had wide experience in the Sanitary and Gas Trades.
Address particulars to No. 2133, care of Mr. King, 11, Bolt Courtr, FLEET STREET, E.C.

A QUALIFIED Manager is wanted by the Kendal Gas and Water Company.
Apply, by letter only, stating experience, &c., and salary required, giving references, to the CHAIRMAN, Kendal Bank, KENDAL.

WANTED, a handy Mechanic as WORKING FOREMAN, for a small Gas-Works near London. One used to Forge work, Main and Service laying, Meter reading, Engine, and Exhausters. Abstainer preferred. Wages, 32s. per week.
Applications, with testimonials, to be addressed to No. 2132, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman, between 30 and 45 years of age. Must have had good experience in Carbonizing and the General Work of a Gas-Works, and competent to do the ordinary Fitting and rough Smithing required, and to take charge of the Works in the absence of the Manager. Wages 30s. per week, with Cottage, Coal, and Gas.
Apply, by letter, before the 3rd of September next, stating age and whether married or single, and enclosing references, to
S. CARPENTER,
Manager.
Gas-Works, Dorking.

WANTED, a set of Four second-hand PURIFIERS, 16 feet or 18 feet square in good condition, with Valves and Connections complete.
Particulars to A. MARSTON, Gas-Works, WILLENHALL.

WANTED, a second-hand Wet Gas- METER, capable of passing not less than 1000 cubic feet per hour. A small Station Meter preferred.
Reply to the MANAGER, Gas-Works, PEEBLES, N.B.

WANTED, to purchase, a small Portable GASHOLDER.
Apply, stating all particulars and price, to the BUCKLEY GAS COMPANY, LIMITED, 7, Henblas Street, WREXHAM.

ROUND Station Meter, by Porter & Co., of Lincoln, FOR SALE; 3-inch Inlet. Cheap.
Apply to SHIPYARD, RUTHERGLEN, N.B.

FOR SALE—Set of Four Purifiers (size 6 ft. by 6 ft.), with Centre-Valve. All in good condition.
Apply to the Superintendent, County Asylum, Prestwich, MANCHESTER.

FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. MARSH, 41, Corporation Street, MANCHESTER.

GAS-METERS FOR SALE.
THE Royal Agricultural Hall Company, Limited, Islington, have FOR SALE one 500-LIGHT DRY METER, and one 200-LIGHT DRY METER, which until recently have been used at the Hall, and are in good working order.
Apply to R. VENNER, Secretary, Royal Agricultural Hall Company, Limited, ISLINGTON.

THE Gas Committee of the Leeds Cor- poration invite TENDERS for the purchase of about 80 tons of SPENT OXIDE, now lying at the Gas-Works, New Wortley.
Samples may be obtained on application to Mr. Lupton, Gas Department, Municipal Offices, Leeds; and price per unit of Sulphur per ton to be quoted, addressed to the Chairman of the Gas Committee at the above address not later than Monday, the 12th of September next, at Twelve at Noon.

HOLBORN UNION.

GAS TAR AND AMMONIA FOR SALE.
THE Guardians of the Poor of the Holborn Union are desirous of entering into a CONTRACT for Twelve Months for the sale of the GAS TAR and AMMONIA from their Gas-Works at Mitcham, Surrey. The quantities are about 250 barrels of Tar, and between 4 and 5 tons of Ammonia.
Applications to be sent to me at this Office, on or before Tuesday, the 6th prox.
By order,
JAMES W. HILL,
Clerk to the Guardians.
Union Offices, Clerkenwell Road, E.C.,
Aug. 22, 1892.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, 68, Bath Street, GLASGOW. Telegraphic Address: "Gas, Glasgow." Depôts throughout England and Scotland.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE, 173, Fentiman Road, LONDON, S.W.

TO CONTRACTORS AND BUILDERS.
THE Directors of the Willenhall Gas Company are prepared to receive TENDERS for the construction of a GASHOLDER TANK, 102 feet diameter, and 25 feet deep, at their New Works, adjoining Short Heath Railway Station, in accordance with Plans and Specifications which may be seen on application at the Company's Offices, Lower Lichfield Street, Willenhall.
Sealed tenders, endorsed "Tender for Tank," and addressed to the Chairman of the Company, to be delivered not later than Wednesday, the 31st day of August.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
A. MARSTON,
Secretary.
Gas-Works, Willenhall,
August 18, 1892.

TO TAR DISTILLERS AND OTHERS.
THE Directors of the Gloucester Gas- light Company invite TENDERS for the surplus TAR produced at their Works for One, Two, or Three years, from the 1st day of October next.
The Tar will be delivered into Boats or Barges at the Company's Wharf, on the Gloucester and Berkeley Canal.
Offers to be at per ton of 200 gallons and per ton by weight.
Payments, cash monthly.
Sealed tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, Eastgate, Gloucester, to be delivered not later than Tuesday, the 6th day of September next.
The Directors do not bind themselves to accept the highest or any tender.
By order,
WILLIAM E. VINSON,
Secretary.
Gas Offices, Gloucester, Aug. 11, 1892.

COUNTY BOROUGH OF HUDDERSFIELD.
(GAS DEPARTMENT.)

TO MANUFACTURING CHEMISTS, ETC.
THE Gas Committee of the Huddersfield Corporation are prepared to receive TENDERS for the SPENT OXIDE during the ensuing Twelve Months. The Spent Oxide will contain from 50 to 70 per cent. of Sulphur of good quality. Parties tendering to state the price per unit of Sulphur contained in one ton of the Material.
The Spent Oxide to be put into Trucks at the Hillhouse Depôt, Huddersfield, or into Barges on the Canal at the Huddersfield Gas-Works, free of charge.
Tenders to be addressed and sent to Mr. W. R. Herring, Gas-Works Engineer, Leeds Road, Huddersfield, not later than Monday, Sept. 5, 1892, endorsed "Tender for Spent Oxide."
By order,
H. BARBER,
Town Clerk.
Huddersfield,
Aug. 17, 1892.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)
THE Gas Committee are prepared to receive TENDERS for the supply and erection of RETORT-FITTINGS, Wrought-Iron FOUL and HYDRAULIC MAINS, Cast-Iron FLOOR PLATES and COLUMNS, and Wrought-Iron JOISTS, required at their Portwood Works.
Drawings and Specification may be seen, and information obtained, on application to the Engineer, Mr. S. Meunier, Millgate Gas-Works, Stockport.
Tenders, endorsed "Tenders for Retort-Fittings, &c." and addressed to the Chairman of the Gas Committee, must be sent in on or before Thursday, Sept. 1, 1892.
The resolution of the Council that contractors will be expected to pay the average rate of wages paid in the district applies to this contract.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
WALTER HYDE,
Town Clerk.
Stockport, Aug. 18, 1892.

TENDERS FOR LIGHTING THE CITY OF BELEM DO GRAM-PARÁ, UNITED STATES of BRAZIL, by GAS or ELECTRICITY.
NOTICE is hereby given, that Tenders for the above service will be received up to the 30th of November next, at the Office of the Secretary to the Municipal Council of Belem do Gram-Pará.
Particulars can be had on application to the BRAZILIAN LEGATION, 55, Curzon Street, Mayfair, LONDON (where a plan of the said City may be seen); or to the BRAZILIAN CONSUL-GENERAL, 6, Great Winchester Street LONDON, E.C.

EASTBOURNE GAS COMPANY.

TENDERS FOR COALS.
THE Directors of the Eastbourne Gas Company invite TENDERS for the supply of 17,500 tons of best unscreened GAS COALS, to be delivered at Eastbourne Station, from the 1st day of October next to the 31st day of July, 1893, in equal monthly quantities; the first delivery to be made on the 1st day of October next.
Further particulars may be obtained from, and sealed tenders, endorsed "Tender for Coals," must be sent in not later than the 3rd day of September, 1892, to the undersigned.
J. H. CAMPION COLES,
Secretary.

TENDERS FOR GAS COAL.
THE Malvern Local Board invite Tenders for the supply of 1000 tons of best screened SILKSTONE, and 1000 tons of best screened WIGAN GAS COAL, to be delivered and stacked in the Gas-Works, Great Malvern, one-half thereof before the 30th of November next, and the remainder in such quantities as may be required from time to time.
Tenders, endorsed "Tender for Gas Coal," to be sent to the undersigned, before Twelve at Noon on Monday, the 29th inst.
The Board do not bind themselves to accept the lowest or any tender.
WILLIAM LAMBERT,
Clerk to the Board.
Local Board Offices, Malvern,
Aug. 19, 1892.

DALTON-IN-FURNESS DISTRICT LOCAL BOARD.

TO CONTRACTORS.
ASKAM GAS-WORKS.
THE Askam Lighting Committee invite TENDERS for the erection and completion of GAS-WORKS at Askam-in-Furness.
Plans and Specifications may be seen, and Forms of Tender obtained, on and after the 24th inst., on application at the Surveyor's Office, Dalton-in-Furness.
Tenders must be delivered at the Clerk's Office, not later than Wednesday, the 31st day of August, 1892.
The Committee do not pledge themselves to accept the lowest or any tender.
J. TYSON,
Clerk to the Board.
Clerk's Office, Dalton-in-Furness,
Aug. 19, 1892.

COUNTY BOROUGH OF WIGAN.

TO TAR DISTILLERS AND OTHERS.
THE Gas Committee of the Wigan Cor- poration invite TENDERS for TAR for One Year, commencing on the 1st of September, 1892, and terminating on the 31st of August, 1893.
Particulars and Forms of Tender may be obtained on application to the undersigned.
The highest tender not necessarily accepted.
Tenders, sealed, and endorsed "Tar," to be addressed and delivered to Arthur Smith, Esq., Town Clerk, on or before the 19th of September next ensuing.
JOS. TIMMINS,
Engineer, &c.
Borough Gas-Works,
Wigan, Aug. 18, 1892.

BRIGHTON & HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.
NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 2nd of September, 1892, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1892, to declare Dividends, to elect Auditors, and for other purposes.
The Transfer Books of the Company will be closed from the 20th of August to the 2nd of September, both days inclusive.
Immediately after the General Meeting, an EXTRAORDINARY GENERAL MEETING will be held to authorize the further issue of Debenture Stock, in accordance with the Brighton and Hove Gas Act, 1879, and to pass such Resolution thereon as to the Meeting may appear expedient.
By order,
W. H. HARDY,
Secretary.
Offices: 5, Great Winchester Street,
London, E.C., Aug. 19, 1892.

Price 5s. per 100, post free.
The Composition and Use of Gas Lime in Agriculture.
By (the late) Dr. A. VOELCKER,
Professor of Chemistry to the Royal Agricultural Society of England.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the surplus TAR produced at their Works during the next Twelve months from Sept. 1 (about 1200 tons).

Tenders, endorsed outside, to be addressed to the Chairman by the 27th of August inst.

Particulars from the undersigned.

JOHN CHEW,
Engineer.

Gas Office, Blackpool,
Aug. 14, 1892.

TO PIPE FOUNDERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the supply of about 400 tons of 12-inch and 8-inch GAS-PIPES, of average weights, turned and bored, coated and tested, delivered at Gas Siding, Central Station here, and also about 10 tons of SPECIALS.

Tenders, endorsed outside, to be addressed to the Chairman by the 27th of August inst.

Specification, &c., on application to the undersigned.

JOHN CHEW,
Engineer.

Gas Office, Blackpool,
Aug. 14, 1892.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for One year, from the 14th day of October next.

Delivery on Company's Works, filled into purchaser's tanks.

Payment, Cash Monthly.

Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Wednesday, the 31st of August next; but the Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. PADFIELD,
Secretary and Manager.

Exeter, Aug. 5, 1892.

DARWEN CORPORATION GAS-WORKS.

TENDERS FOR TAR.

THE Gas Committee of the above Corporation invite TENDERS for their surplus TAR for One year (about 800 tons), delivered on the Railway in Contractor's Tanks.

Sealed tenders, endorsed "Tar," will be received by the undersigned up to Twelve Noon, Aug. 29 inst.; but any further particulars must be obtained from Mr. T. Duxbury, Gas Engineer.

By order,
CHAS. COSTEKER,
Town Clerk.

Darwen, Aug. 13, 1892.

TO COAL OWNERS.

THE Directors of the Hornsey Gas Company invite TENDERS for the supply and delivery of 15,000 tons of best screened GAS COAL, in lots of 5000 tons each. Deliveries to be made, as required, from the 1st of October next to the 1st of September, 1893.

Further particulars may be obtained from the undersigned.

Sealed tenders, addressed to the Chairman of the Hornsey Gas Company, 63, Chancery Lane, W.C., to be sent in on or before Thursday, the 25th inst., endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender.

H. J. MITCHELL,
Manager.

Gas-Works, Hornsey, N.,
Aug. 8, 1892.

TO COAL MERCHANTS, SHIP OWNERS, AND OTHERS.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the supply of about 8000 tons of best approved DURHAM GAS COAL, to be delivered before the 1st of May, 1893.

Further Particulars and Forms of Tender to be obtained from Mr. Beynon, the Manager of the Company, Hollacombe, Paignton; and tenders to be sent to the undersigned on or before the 24th inst.

The lowest tender not necessarily accepted; and the Directors reserve the right to accept part of any tender.

By order,
JOHN KITSON,
Secretary.

Torquay, Aug. 10, 1892.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 27th day of August inst., at Three o'clock in the Afternoon precisely, to receive the Report of the Directors, and Statement of Accounts for the Half Year ended the 30th of June last, to declare Dividend, for the Election of Two Directors and an Auditor for the ensuing year, and for transacting General Business.

The Transfer Books for Consolidated Stocks will be closed from the 12th to the 29th inst., both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company,
Willoughby Lane, Tottenham,
Aug. 12, 1892.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Price 6s., Cloth Bound, Bevelled Boards.

THE

GUIDE-FRAMING OF GASHOLDERS

AND OTHER PAPERS

CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

To effect a great saving in

GAS-FURNACES use our

Special Derbyshire **GANNISTER BRICKS.**

ADDRESS

JAMES WHITE & Co., Limited,

ALBERT WORKS, WIDNES.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS,

Near HALIFAX,

MANUFACTURER OF SULPHURIC ACID

OF EXTRA QUALITY FOR MAKING

WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE Purchased for Cash against Delivery.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ALEXANDER RUSSELL & CO.,

Cannel and Gas Coal Merchants,

53, WATERLOO STREET, GLASGOW.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over

400,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

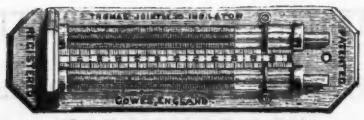
Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,

COAL OWNERS, NEWCASTLE-ON-TYNE.

Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.



THOMAS'S JOINTLESS GAS GAUGES.

COWES, I.W.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time labour, and expense.

For particulars, price, &c., apply to Mr E. PRICE, Inventor and Patentee, 23, Alwyne Road Canonbury, LONDON, N.

Prices are Reduced.

AUG. KLÖNNE,

DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in

Efficiency, Economy, Durability, and Easy Working.

ROSEWELL BOGHEAD.

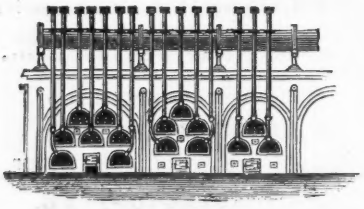
Yield of Gas per ton . . . 13,215 Cub. Ft.
Illuminating Power . . . 37·56 Candles.

GAVIN PAUL & SONS,

CANNEL COALMASTERS,

EDINBURGH.

DEMPSTERS'



RETORT-SETTINGS,

RETORT-FITTINGS,

ELLAND.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

C. MEIKLEJOHN,

OLDBURY, BIRMINGHAM.

(Late N. MEIKLEJOHN, Longwood.)

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

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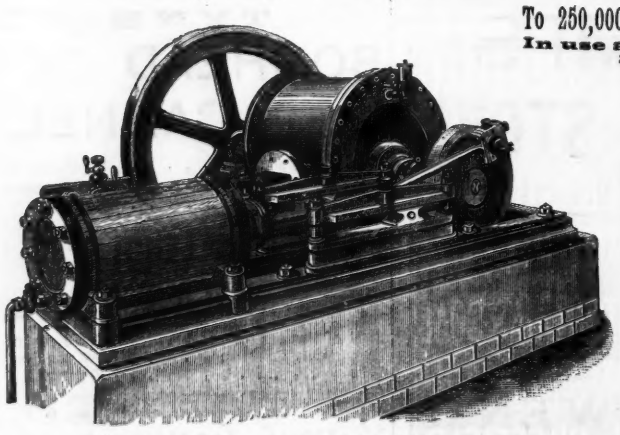

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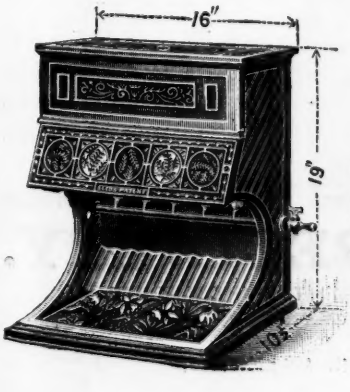

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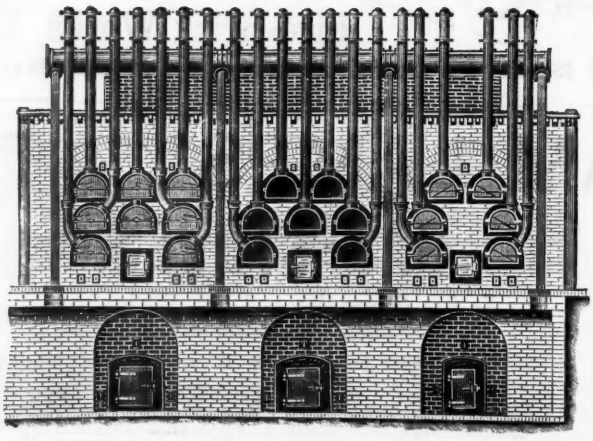

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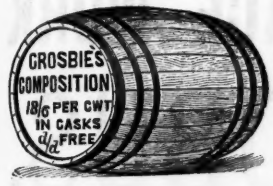

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Absolutely Harmless and free from Acids.

Crosbie's Paints for Gas-Works. Economical and Durable.

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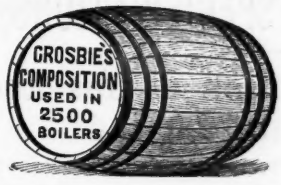

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1. Smooth interior, preventing adhesion of Carbon.
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SOCKET-PIPES FOR GAS OR WATER PURPOSES.

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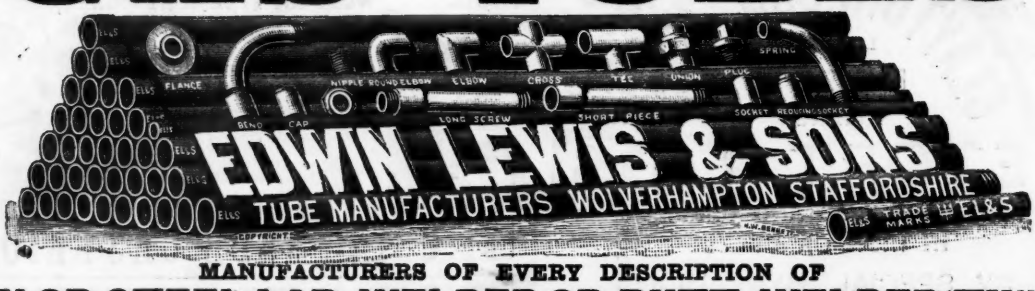

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ALSO ALL KINDS OF

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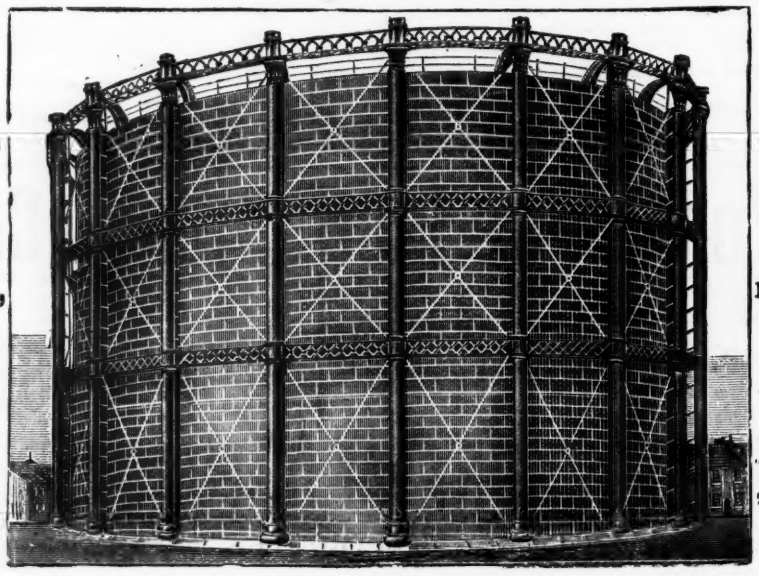

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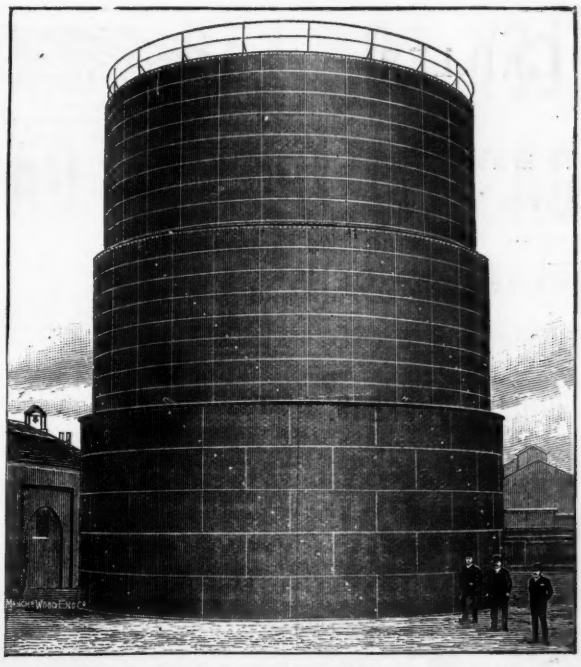
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder recently erected, in a wrought-iron Tank, for the Birmingham Oxygen Company, at their Works, Saltley, Birmingham. The bottom of the Tank is fixed level with the ground, upon a concrete foundation.

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TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
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The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

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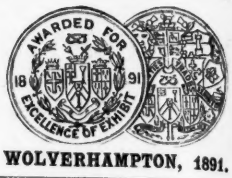

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THE NEWEST PATTERN COOKER INTRODUCED.

Most substantially constructed.

Packed all round with Silicate to retain the heat.

Oven well ventilated, and provided with Flue Damper.

Gives a powerful top heat.

Double Grill of simplest and most efficient kind.

LINED THROUGHOUT WITH BEST ENAMEL.

These Cookers have already been adopted by The Gaslight and Coke Company, as well as by many other prominent Companies.

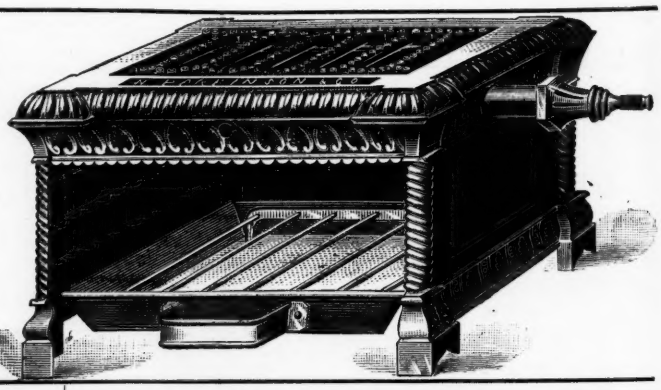
PARKINSON'S GRILLER

(Registered Design),

Fitted with twofold Fret, giving intense heat for grilling purposes, and supplying at the same time splendid boiling power.

WITHOUT MECHANICAL ACTION.

Unrivalled for use in Restaurants, &c.



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PARKINSON'S SPECIAL ROUND ELBOWS.

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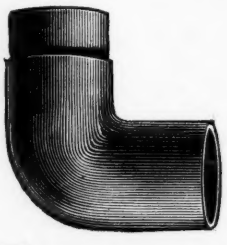
Stamped in two halves from Special Dies, Seamed, and Tapered.



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Telegraphic Address: "PRECISION."

[See also Advt. p. 332.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Aug. 23, 1892.